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EDITORIAL NOTES—GAS, &c.

The Old Spirit and the New Chairman.

THOUGH not the voice of Sir George Livesey, in matter, manner, and lucid exposition, the address that the proprietors of the South Metropolitan Gas Company heard at their meeting last Wednesday must have reminded them forcibly of the days and the presence that can return no more. It was a compliment to the new Chairman (Mr. Charles Carpenter) that the proprietors came to the meeting in the solid numbers that have been witnessed for many years past; it was a compliment to him that the proprietors could not after his address find a single point bearing upon the report and accounts before the meeting that required further elucidation. With the freshness of impression upon us as we write, it is not too much to predict that the old interest of the proprietors in the affairs of the undertaking will not flag in future for want of inspiration. They had, if the address be taken section by section, a complete declaration of the commercial gas creed of their new Chairman; and it is, in letter and spirit, in accord with the traditions of the Company, and in accord with the position that the concern has established in the recognition and interests of the people of South London. It breathed of a definite yet expansive, active, and generous policy; and it laid bare the vital principles that apply to the gas trading of the day. It was a commercial speech addressed to those whose interests are commercial; and it accorded with the anticipation of those who of old know the new Chairman. His whole professional and business career has been so closely allied with the Company, and in the last ten years with the powerful influences of the late head of the concern, that the philosophic gas policy of the past has (so to speak) become an inseparable part of his nature. And so from the beginning to the end of the meeting, the Chairman carried the proprietors with him. It was a good introduction to work in a new capacity; and the proprietors went their way well satisfied and confident.

The proprietors were likewise gratified with the report and accounts. They could not be otherwise; seeing that, though there was a set-back in consumption of 1·7 per cent., and the revenue from coke had considerably diminished, working improvement and economies had enabled the transference of a larger balance to the net revenue account than twelve months ago. No secret at all was made of the fact that, though the half-year's working has come out financially good, there are considerable districts within the Company's area of supply that are, in the economic and commercial senses, in a bad way, through unlet shops and dwelling-houses. In giving prominence to this matter, it should not be forgotten that the present position probably represents the high-water mark of the influences that have acted in concert to bring about the slump in property in South London. Bad trade, it is to be hoped, is now at its worst; the migration of the better class residents farther afield, there is fair reason to believe, will not proceed in future at such pace as in the past; and the indications are that the cheap travelling facilities which are being provided to all parts of the district will have the influence of largely filling in the blanks, and so restoring—if not entirely, in part—the normal level of local prosperity. There is every cause to think the future will in this respect be better for the Company than the immediate past. At any rate, in the matter of cheap gas and fuel, they are doing their part in making the area of supply attractive. Still, while there is an abnormal condition prevailing, the Company have not only the loss of the business that the opposite condition would yield, but there is capital lying idle in services, and capital not being put to its full use through other plant not being worked up to the limit of its useful and safe capacity.

There must not, however, be too much stress laid on the accretive tendency of unlet properties in recent years because of the decrease in gas consumption in the past half year. Weather and temperature have had something to do with the decrease, and so has the condition of trade. The diversity of gas use is a factor of the utmost importance and strength to the industry. But when there is a blending of bad trade and mild weather in depressing consumption for industrial and heating purposes, and for the lighting of business and industrial premises, such spreading of depression must have a big effect (where there is not the compensation of a constantly growing district) in causing downward fluctuations in business. Conversely, if there are months of dull cold weather, with generally flourishing business and trade, such a combination of conditions acting upon the diverse uses of gas must make an appreciable upward difference in the volume of business done. To the business-depressing circumstances of the half year, there must be added the more economical means of illumination that the industry offers to-day. Never before has the relationship between economical consumption and efficiency attained such extremes. Touching upon this point, the reference to the new street-lamp inverted burner that has been developed in the Company's laboratory (to which reference was made in treating recently of the Beckenham trials with modern gas-burners and the metallic filament lamp), as well as the mention of work now going forward in the endeavour to eliminate what are conceived to be drawbacks in the inverted system for domestic lighting, made points in an altogether interesting address.

The full depths of the possibilities of the industry, both in manufacture and in trading, have not yet been sounded. The past twenty-five years especially have shown it to be a procreative industry. In the manufacturing department, the increased gas make and the reduced fuel account, in the case of this Company, are but the beginnings of a state of things when the ultimate produce for sale per ton of raw material will be greater than it is at present. The Company have not yet reaped the full advantage of the standard of illuminating quality that their statute permits. There are systems within reach that will, if other considerations commend, permit in due season the reaping of that advantage. The direction of progress, however, Sir George Livesey firmly believed, has to be pointed out by the laboratory. Hence his latter-day interest in the founding of a chair of Gas Engineering and Fuel at the Leeds University. Of the same way of thinking is the new Chairman and his colleagues; and in this is found one of two reasons why the Board last week voted a sum of £2000 to the Livesey Memorial Fund, to be employed in endowing the Livesey Professorship of Gas Engineering and Fuel at Leeds. This £2000 is a liberal donation and worthy of the Company; and it is equivalent to the commutation on a 5 per cent. basis of their present annual contribution of £100. This is a matter, however, to which further allusion is made elsewhere. Pursuing the line of thought suggested by the Chairman's speech, the limits of the applications of gas have not by any means been yet defined. But these extensions of application, competition, the safeguarding of interests, all leave their impression on the working expenses of the gas business. The gas consumers ask for more extended service; and what has to be fully recognized is that they must have it. And the sooner gas administrators bow to the inevitable, the better for the businesses the destinies of which they largely control.

While, however, the gas consumers ask for more, they do not in any way assist in lightening the expenses of the gas supplier. They do not entertain the notion that that is any part of their business. The indifference among them is as remarkable as their appreciation when they are reached in a proper manner. The loss of a human life occurred in one instance in the South London district through neglect of a printed notice of the Company that they would, free of cost to the consumers, make secure all water-slide chandeliers.

The printed notification did not thus sufficiently serve its purpose. The people have not been sufficiently trained to appreciate that it may be to the interest of a commercial company to do something for nothing. But canvassers are bringing to light thousands upon thousands of these dangerous fittings; and they are now being dealt with by the Company to the number of many thousands every half year. The work is appreciated; personal contact and the evidence of the Company's interest for the safety of their consumers have their good effects among the householders; and above all the danger is being eliminated from the Company's area of supply. It costs money, as the revenue account shows; but it is a good investment and a good advertisement. Linked with this subject of danger and safety was the reference by the Chairman to the Bermondsey explosion. Despite the verdict of the Jury, the Chairman firmly but respectfully denies that the Company's workmen took any part in bringing about the dreadful catastrophe, the causes of which are traceable back to the negligence of the Metropolitan Board of Works of years ago in allowing the continued existence of a disused sewer. The Chairman insists that the Company's men on the occasion of the explosion only used modern safety lamps; and he declines, in the name of the Company, to accept any responsibility in the matter. The people of South London, however, will mark the old charitable spirit of the Board in the words of sympathy with the bereaved and the sufferers, and in the statement that, if the Company can do anything as a matter of grace which will not be construed as accepting responsibility, they will do it. The address was luxuriant in point; but here there has simply been an attempt to sketch the vein of thought that prompted utterance from the chair, and that impressed the hearer.

The Livesey Memorial Fund.

A NEW complexion has been given to the Livesey Memorial Fund by the generous contribution of £2000 by the South Metropolitan Gas Company, followed immediately after by the announcement that the Gaslight and Coke Company would fulfil the original intention of commuting their annual contribution of £100 to the support of the Chair of Gas Engineering and Fuel at the Leeds University by handing over to the fund £1000. These two amounts have at one sweep put heart into those who have for the time being, in the name of the gas industry, the responsibility of furthering the interests of the fund, and of keeping the contributions in safe custody. It must be said that the situation a week ago was anything but encouraging. But now the fund amounts, taking immediate credit for the two large subscriptions, to £6931 1s. In bringing the matter before the cordially assenting proprietors of the South Metropolitan Gas Company last Wednesday, the reasons that were submitted by the Chairman (Mr. Charles Carpenter) as to why the Company should subscribe to the fund were appropriate and much to the point; and the same line of reasoning should be the means of bringing those companies and local authorities who have not yet favourably considered the question of contribution to an immediate determination of the laconic question that Mr. Carpenter propounded not long since—"How much?" The two contributions only make the fund rather more than two-thirds of the total amount required. The sum of £3931 (the total less the £3000 of the South Metropolitan and Gaslight Companies) has been several weeks accumulating; so that the goal, with £3069 still to come in, cannot be said to be in sight yet. The Leeds Corporation Gas Committee have the question under consideration; and certain of the Suburban and Provincial Gas Companies will, without question, now at an early date be forwarding contributions. The Society of British Gas Industries are also building up a joint contribution from among the firms representing the membership. These collectively will no doubt make a fairly large sum out of the balance still required. But it will fall considerably short of making the £10,000. Gas companies and local authorities—benefiting as they have done from the work of Sir George Livesey—have been, with the exception of a comparatively few, slow to move in establishing the fund. It is hoped that their contributions will now come in with accelerated speed. We know there are instances in which differences of opinion from Sir George are being made the ground for abstention from the fund. In such cases, the abstention will be the most fitting memorial to narrow-mindedness. On looking down the list of the personal contributions already made, it is pleasant and interesting to see names that bring to mind past differences of opinion. But differences of opinion on one or occasional points need not wreck friendship during life, nor abscind the after-tribute of the admiration of the living for a life's work as a whole.

A Question of Demurrage.

COMBINATIONS or amalgamations in trading or other businesses carried on for profit have, it cannot be gainsaid, in most cases their economic advantages; but such combinations may not in all respects be to the benefit of the community at large. Not content with the economies that are the natural growth from combination, there is, unless statutory obligation or still existing competition forms an obstacle, a tendency for those composing the combination to look around and see where their new position enables them to increase the flow of their revenue channels, to the disadvantage of others. Something of this kind has happened in Scotland, where a working agreement has been effected between the three great Railway Companies; and what has occurred there, unless there is intervention by the Board of Trade, may occur (by the tightening-up of existing conditions) in England with the advent of the interlinking of working between the English Companies. But sufficient for this occasion are the troubles of the gas undertakings and traders in Scotland. Applying to all traders alike, the Railway Companies have proposed a scale of demurrage charges, sidings-rent, &c., which is most objectionable, because, under some conditions, unfair and extortionate. The demurrage minimum is 1s. 6d. a day for a certain period, and for sidings-rent the Railway Companies contemplate charging 6d. per waggon per day, which a simple calculation shows to be a preposterous proposition. There is something to be said on the side of the Railway Companies for inflicting charges that shall have the wholesome effect of compelling traders to unload within a reasonable time-allowance, and not keep waggons standing as a convenient means of storage. But there should be discrimination as to the class of traders upon whom a demurrage charge amounting to a penalty is imposed; and further it should be an indispensable condition of the imposition that the Railway Companies are not themselves at fault in delaying delivery in such manner that a trader's sidings become blocked through no act or control of his own, thus causing his capacity for discharging and receiving to become exceeded. It is obvious that short-period heavy charges of this kind would place a power in the hands of the Railway Companies which they could exercise arbitrarily and injuriously—we do not say with dishonourable motive; but they could make the traders the victims of delay in delivery and of heavier expense through considering primarily the convenience of their own transmission arrangements—passenger and mineral. Though themselves parties to the production of the causes of delay in unloading, the Railway Companies are to be the beneficiaries of the demurrage penalty.

The gas undertakings of Scotland have long experience of the delays of the Railway Companies, and of the delays in the dispatch of their coal by the collieries, over whom they have no control. From these two causes, they have also experienced the congestion of their sidings; the incoming of greater supplies at one time than their capacity enables them to promptly deal with; and, while waiting for supplies, they have had to fall back upon coal in store, and incur the expense attaching to lifting from reserve and to replacing from succeeding deliveries. They therefore view with some dismay the proposed demurrage and siding impositions of the Railway Companies; and it is clear they have come to the conclusion, by their active opposition to these charges, that the working amalgamation of the Railway Companies is not for them an unmixed blessing. Active in getting the gas undertakings together on this matter have been the Edinburgh and Leith Gas Commissioners and their Engineer (Mr. W. R. Herring); and the valuable collaboration of the Glasgow Gas Committee and their Engineer (Mr. Alex. Wilson) has been accorded. In fact, we believe there are only about four gas undertakings of above 50 millions output in Scotland that have not given their support—though not necessarily out of sympathy with the movement—to the action taken by the representatives of gas undertakings who have been present at meetings convened from Edinburgh to consider the subject. The issue of the conferences of these representatives was a deputation to Mr. H. J. Tennant, the

Parliamentary Secretary of the Board of Trade, yesterday week. We regret there was no great amount of encouragement given to the plea of the deputation that—as undertakings under statutory control, and working under circumstances peculiar to the gas industry—they should be placed under favoured nation conditions, having absolute exemption or, if there was no chance of escape from the new demurrage imposition, that it should only apply to an average over a given period. The Committee have only opened the ball by their deputation to the Board of Trade; and now they are to interview the Railway Companies, and keep in touch with the Board over the matter. But Mr. Tennant did not hold out much hope of any preferential treatment; and he gave the delegates to understand that, at the moment, the Board had under consideration a proposition that at all events might afford some relief to traders, but was not yet ripe for disclosure. From the general position of affairs, it would seem that exemption, however good the case that can be advanced, must go by the board. The condition as to averaging—Mr. Tennant did not look very kindly upon it, though not positively antagonistic—should, having in view the causes operating to congestion, be urged to the utmost as an equitable basis of settlement.

In the receiving and dispatching of goods, gas-works undertakings are, where there are not means of water conveyance, exceedingly good customers of Railway Companies; but gas undertakings suffer several disabilities—all of which, internal and external, should be taken into account by the Railway Companies in considering the submission that the undertakings should not be placed in the same category as ordinary traders whose traffic with the Railway Companies is only intermittent. No other class of trader can ever give better dispatch to waggons than gas-works, when they get them in, because their consumption of incoming material and output of material for dispatch are constantly going on. With regular deliveries, waggons can be in to-day and away to-morrow. It so happens, however, that when the requirements of gas-works are at the maximum, winter traffic on the railways is under its worst conditions, through fogs and other weather severities, and the heavy traffic of the Christmas and New Year's Holidays. It so happens, too, that at the same time, the collieries are at their busiest. Then is it just that, because deliveries are retarded by the exigencies of the railways and of the collieries, and supplies subsequently arrive at a rate beyond the power of immediate absorption, the gas undertakings should be penalized? If the Railway Companies refuse to listen and modify their demand, then they make the undertakings the victims of circumstances that are uncontrollable by them. They are between two forces opposing—not wilfully, but having an influential power in the matter—the regularity of their deliveries, and, singular to absurdity, one of those very forces exercising the right to fine for consequences that they assist in producing. This is a serious matter for the gas undertakings; and if the Railway Companies have any sense of equity, they will see and allow that the position of the gas undertakings is altogether different from that of the ordinary trader, and requires distinctive treatment. Whatever be the ultimate agreement, there is no question that it will have to be one that will be binding upon all the gas undertakings of Scotland. If, however, nothing special is done (as it should be done) for the gas undertakings, it is to be hoped that the compromise between the Railway Companies and traders generally that the Board of Trade have in embryo will be carried to a favourable issue, and that it will really do something to relieve the situation. Meanwhile, in the anxiety of traders to save demurrage, great confusion has arisen on the Scotch Railways. Miles and miles of empty waggons, it is stated, can be seen standing on sidings, which suggests that the action of the Railway Companies has shown their own inability to cope with a position that had not come within their view as a possible result of their circular.

Municipal Law Breakers.

It was a Gas Company that brought about the introduction of what is known as the Bermondsey clause in the 1902 Electric Lighting Order of the Borough Council of the district from which the clause took its name; and it has fallen to Gas Companies since to persevere in securing the insertion of the amended form known as the Northumberland clause in Acts incorporating powers for municipal trading in electricity. It is an Electric Supply Company who have cried the loudest against the evasion of the original clause by the Bermondsey Council. Most of our readers are aware that, putting the matter broadly, the purpose of the Bermondsey clause, and of the superseding Northumberland clause, is to ensure that the charges for electricity are so ordered that income shall at least harmonize with expenditure. The agitation by Gas Companies as large ratepayers for the incorporation of the clause in local authority statutes applying to electricity supply has not, however, met with general success, through the inconsistency of view of Parliamentary Committees. The clause in one form or another has been inserted in some Acts or Provisional Orders, indicating at any rate the existence among a section of our legislators of the opinion that municipal trading should be conducted on ordinary commercial lines, and every undertaking be made self-supporting. The principle, too, has been adopted in the new model clause dealing with trading in wiring and fittings by municipal electricity departments; and this gives ground for hope of its extension to the larger affairs of such undertakings. Until this is done, and there is machinery for compelling compliance, the propensity for speculative trading at the ratepayers' expense will continue to grow. The old cry in opposition to the clause was that it was unjust to apply it to the early years of municipal electricity undertakings when they were developing their business; and this grievance the Northumberland clause provided for by allowing a period of grace for cultivating business. In the majority of municipal electricity undertakings, the period for business establishment has surely now been long enough for attaining a sound commercial basis; but still there are examples brought to public view almost weekly of conduct in the manipulation of municipal trading accounts that would be regarded as a serious infraction of right principles in the administration of a private commercial concern, and of ratepayers being still, directly or indirectly, called upon to give compulsorily financial succour to the undertakings.

In the case of the Bermondsey Council, the original clause has had no effect in producing honest finance, and in safeguarding the interests of the ratepayers. On the contrary, it has caused the Council to indulge in most censurable methods to make their electricity accounts superficially comply with the terms of the clause. Year after year, the figures are shuffled, items of expenditure are transferred to the district rate account, and no proper provision is made for the depreciation of the plant. Besides which, some 50 per cent. (and the proportion is increasing) of the electricity output is used by the public departments, and has been charged for at prices in excess of those that are asked by the London Electric Supply Corporation, Limited, who have competing powers in Bermondsey. Furthermore, accounts for the last financial year show that a sum of £3582 set aside in 1906 as a renewals reserve (and which has not been supplemented since) has been drawn upon to the extent of £2659 to pay interest on loans. The Managing-Director of the Electric Supply Corporation (Mr. R. Stewart Bain) has, year after year, without effect, called the attention of the Local Government Board to these irregularities. He has just done so again; and it is probable the matter will now be formally brought to the attention of Parliament. The Electricity Corporation and the South Metropolitan Gas Company have both grave reason to complain of the practices and the wilful evasion of the clause of 1902. By allowing the continuance of this state of things, there is unfair competition; and both concerns, as large ratepayers in the borough, suffer by being compelled to contribute to a loss that it is sought to hide by what in truth is nothing less than falsification of the accounts. Neither the Local Government Board nor Parliament ought to ignore responsible representations as to the violation of parliamentary enactments; and it is sincerely to be hoped the matter will be kept well to the front until obedience to the law is enforced. Municipal authorities have large powers conferred upon them in ensuring that, within their area of jurisdiction, there is no infringement of the law; but some of them are not averse to themselves breaking the law by sinister procedure if it suits their books, or enables them to hide the true character of their administration, or rather maladministration.

The Cannon Street Immaculates.

There is in our possession a copy of a circular sent out by the Secretary of the Amman Valley Gas Company (P. Davies)—a person who has played many minor parts in the promoting

work of the Eaton clique—which circular purports to be a reply to the grave assertions contained in the one emanating from a Committee of Shareholders, as published in our issue of Jan. 26 (pp. 224, 256). There is nothing in it in the nature of a reply; and it is, in fact, one of the most obvious of "red herrings" that we have ever seen drawn across a trail. It answers nothing; and it confesses nothing, but that the No. 99, Cannon Street people had worked the Amman Valley capital up to an improper and unreasonable amount. The first paragraph of the document before us says that the circular of the Committee of Shareholders affords a "splendid opportunity of disclosing the opposition's tactics, against which the Directors have already warned shareholders." The two amusing features of this are that the immaculate Directors in their circular altogether omit to avail themselves of the "splendid opportunity," and that (addressing the shareholders from No. 99, Cannon Street) they should have the conscience to warn anyone against anything, though it might be profitable to the public if they would issue a caution against all over-capitalized concerns hatched at their own City address. The one warning in the circular is not intended as such. It says: "The Directors have already, as you are aware, been successful in obtaining an important concession from the contractors, whereby 5255 shares now held by them are to be cancelled, reducing the Company's issued share capital by £5255—thus bringing the Company's capital on a proper and reasonable basis." Who made the capital so improper and unreasonable a one that this concession was required? The promoters, directors, and contractors have in this concern such an intimate relationship that it is not easy to distinguish the one from the other; and the "success" in obtaining this "important concession" therefore looks like, and no doubt is, the compulsory shedding of excessive gain in an attempt to escape from a tight corner. The whole circular is of such cobweb texture, that surely the densest of the shareholders have been able to see through it.

The Promoters and Parliament.

In the circular noticed above, the virtuous persons who are responsible for its issue state that "the Directors are determined not to allow the shareholders to be deceived by the roundabout methods of the opposition to get possession of the works without giving them every opportunity of seeing that the opposition Bill [the Ammanford] is *not* to their advantage." There is a staunchness about the ring of this; but it is the same old simulated staunchness of many a statement that has appeared in the No. 99, Cannon Street prospectuses. The best opportunity of showing what a fine property the shareholders possess, and how disinterested have been the operations from No. 99, Cannon Street, would be for those responsible for the Amman Valley Bill and the present circular to get into the witness chair in one of the Committee rooms at Westminster, and allow themselves to be subject to cross-examination. Will these promoting gentry so submit themselves and their actions this session? We have our doubts. There is rumour of certain pending negotiations. It was on the 6th inst. that a Committee of Shareholders—Messrs. Cooper, Field, and Jones—met the Directors, and put forward certain proposals which it is thought likely will be accepted. If they are, the shareholders will be informed of the matter. But if they are, we suppose the opportunity for further exposure will be lost, unless the District Council show fight; and some means are taken to get certain gentlemen into the witness chair.

Deserting the Leader.

Meanwhile there seems to be trouble in the Eaton camp. A faithful few continue their adhesion to the fertile promoter of No. 99, Cannon Street; but the novitiates appear to be a bit shy or—shall we say?—too honest for such work as is allotted them. We announced last week that Mr. John Moxon, Solicitor to the Beaufort Company, had retired, as well as Mr. S. J. Acland and Mr. H. Russell. We then expressed our pleasure, and are glad to see from the information to hand that action has already been taken upon the hint then made that honour and duty call for assistance to be rendered to the misled shareholders to obtain a return of their money. Mr. Acland and Mr. Russell have requested the Directors to call a meeting, at which explanations can be made. We hope that, when the meeting is called, Mr. Acland and Mr. Russell will see that it is open to the Press, as they cannot but recognize the fact that they, as gas engineers, owe something to the profession of which they are members in the way of explanation as to the part they took in this promotion. Their letter states that they intend to be present at the meeting to declare the "true" position of the Company. The inference to be drawn from this is that the true position was not delineated in the prospectus. The seceders are also doing their best to get returned the money subscribed by shareholders; but we think, if it were a question of choice with us, there would be a preference to go to the Court to restrain the Directors from trading or parting with any of the Company's assets. Mr. Moxon, the late Solicitor to the Company, suggests in a communication quite sufficient ground for the Court acceding to a suspension of the powers of the Directors in engaging in further commitments or dealing with the moneys of the shareholders. An omission from the prospectus, Mr. Moxon declares, entitles the latter to rescind their contracts; the material fact having been suppressed that the vendors were paying the Directors for their share qualification. The serious allegations are also made that the Company have already exercised their borrowing powers in contravention of section 6 of the Company's Act, 1900, and also that the certificate entitling the Company to commence business was obtained upon a statement which was untrue. It is a far cry from Beaufort to Laindon; but the operations of No. 99, Cannon Street, know no, or at any rate very little, restriction. The Works Manager at Laindon (Mr. B. Rowlson) has also thrown up his appointment, as others have done before him. There were statements in the prospectus of the Laindon Company that were not in accord with fact.

An Arrest and a Warning.

Walter Darby, who took part in what can now, in view of the conviction of Gyde and Marcus, be described as the Welsh Quarries frauds, has been arrested at Liverpool. Darby and Gyde were the promoters of the now defunct West Suburban and Kent County Gas Companies, by which the public lost considerable sums of money. The fugitive was living at Liverpool under a false name. Such happenings, reported as they are in the public press, should act as a warning to the public to exercise the utmost care in selecting companies for investment. We are pleased to observe that Directors are also doing more in the direction of cautioning their shareholders. The Chairman of the Wandsworth and Putney Gas Company (Mr. H. E. Jones) has not been behind in this matter in his speeches at meetings; but, on this occasion, there is a slip attached to the Directors' report to the proprietors, printed in the colour that is the symbol of danger, and headed "Warning." The Board, by this means, caution the proprietors "against being misled by exaggerated prospectuses of insignificant gas undertakings, which usually make comparisons between the prospects of the suggested investment and those of important and prosperous undertakings similar to that of your Company. Within the personal knowledge of the Directors, much loss has been inflicted on unwary investors in such ventures. A simple test of these statements would be to compare the capital asked for in relation to the existing sale of gas, and compare this with the same conditions (say) in this Company."

Contributory Insurance in Germany.

A deputation of four members of the Parliamentary Committee of the Trades Union Congress—Messrs. Shackleton, Steadman, Thorne, and Bowerman—who recently visited Germany have issued a report on the contributory workmen's insurance schemes in operation there; and it is of some interest to compare it with the Acts on our own Statute-Book, which, of course, deal with non-contributory compensation and pensions. The report states that in Germany there are three distinct kinds of compulsory insurance affecting workmen—insurance against accident, insurance against sickness, and insurance against invalidity and old age. As regards accidents, the personal liability of the employer has changed into a collective charge upon the entire trade concerned, which is apportioned to single establishments according to the measure of their risk and the amount of wages paid. The minimum indemnity is, in the case of injured persons, the expenses of medical treatment, and a payment during the period of complete incapacity for work up to 66⅔ per cent. of the annual earnings. During the first thirteen weeks of incapacity for work, the cost of medical treatment and of money benefit

falls on the sickness insurance funds, two-thirds of the contributions to which are borne by the workpeople. The maximum compensation in any case is 60 per cent. of the earnings. The widow and children each receive 20 per cent.—the former until her death or re-marriage, and the latter until the end of the fifteenth year. As a rule the minimum relief in cases of sickness consists of free medical treatment and medicine for 26 weeks, and in the event of incapacity for work financial assistance to the extent of one-half of the average daily wage, or free hospital nursing, besides half the allowance for those dependent upon the sick person. It was in 1891 that the scheme for insurance against invalidity and old age was introduced. The business is conducted by institutions under a State guarantee; and the insurance entitles those incapable of work to pensions without regard to age, and gives old-age pensions to septuagenarians regardless of working ability. The funds are raised by weekly contributions to an equal amount from employer and employee, supplemented by a yearly contribution from the Government of 50 marks for each pensioner. The deputation express the opinion that "the introduction of the State insurance of workmen against sickness, invalidity, and old age has in no way exercised an injurious effect upon the Trade Unions of the country." This is no doubt an important aspect of the matter from their point of view; but information as to the effect on the workers would be of more general interest. It is true that something is said about the condition of the German workpeople; but it is difficult to judge how closely the remarks should be associated with the operation of the insurance schemes. The deputation say that "no beggars or feeble or emaciated men in tatters and rags were encountered in the streets." Hundreds upon hundreds of unemployed were seen; but they "seemed to lack that dejection and absolute misery that unfortunately is so frequently met with in the streets of English towns." Possibly this is to some extent due to the exercise of thrift, which enables the German worker to have something put aside for a rainy day; or possibly it is due to some difference in the causes which give rise to unemployment.

Something New!

Our electrical contemporaries have been grossly deceived. Believing they had found something new, they have published the statement made by the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall), at the recent meeting of proprietors, that, in the reconstruction of one of the retort-houses at Fulham, electrically driven stoking machinery has been adopted. Ever since the projector and ram types of charging and discharging machines have been among us—our contemporaries may as well be told again—electricity has been used for propelling them up and down the retort-houses, and consequently for actuating them. In other forms of stoking machines, compressed air or hydraulic power is found preferable. But as electricity has been used for years for the projector and ram machines, we fail to see the grounds for reference to the Fulham installation as though there was something new in the idea of gas-works employing electricity for such purposes. Perhaps our friends published the statement lest their readers should forget the supposed unorthodox proceeding indulged in by not a few gas-works.

Midland Association of Gas Managers.—The annual meeting of the Association will be held on the 4th prox. at the Grand Hotel, Birmingham, when Mr. W. Langford, of Longton, the President for the forthcoming year, will read his Inaugural Address.

Yorkshire Junior Gas Association.—A meeting of this Associa. tion will be held on Saturday at the Technical College, Bradford. Mr. H. Townsend, jun., will give a description of the electric lighting plant at the Wakefield Gas-Works, and questions on points of interest to members will be discussed.

Ignition-Point of Gases.—At the meeting of the Manchester Literary and Philosophical Society last Thursday, Professor Harold B. Dixon, F.R.S., the President, read an interesting paper on the ignition-point of gases by compression. He referred first to determinations of the ignition-point of hydrogen, carbon monoxide, and marsh gas by Victor Meyer, Le Chatelier, and Hélier, and said that in these cases the gases themselves and the oxygen in which they were ignited were raised to gradually increasing temperatures, by electrical means, until union occurred. More recent experiments by himself and Mr. Coward had narrowed the limits given by the observers named, and the final results were: For hydrogen, 580° to 590° C.; for carbon monoxide, 655° to 670° C.; and for marsh gas, 620° to 630° C. At present, with the assistance of Messrs. Harrison and Reade, he was engaged in determining the temperature at which gases unite when they are quickly compressed into a small bulk,

THE LIVESEY MEMORIAL FUND.

We have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
Feb. 8	Amount already acknowledged	3077	18	0
„ 9	Cardiff Gaslight and Coke Company	105	0	0
	Daventry Gas and Coke Company	2	2	0
	G. M. Gill, Wapping	1	1	0
	South-East of Ireland Gas Association	3	3	0
„ 10	Birmingham Corporation Gas Committee	105	0	0
	J. H. Brown, Nottingham	2	2	0
	Chemical Engineering Company and Wilton's Patent Furnace Company, Hendon	1	1	0
	Herbert N. Clark, Stratford	1	1	0
	Exmouth Gas Company	1	1	0
	Newcastle-upon-Tyne and Gateshead Gas Company	105	0	0
	J. T. Westcott, Westminster	21	0	0
	Weymouth Consumers' Gas Company	5	5	0
„ 11	Burslem Corporation Gas Committee	2	2	0
	Lichfield Gas Company	2	2	0
	Prescot Gas Company	2	2	0
	Northfleet and Greenhithe Gas Company	2	2	0
	William W. Topley, Croydon	1	1	0
„ 12	Elsecar, Wentworth, and Hoyland Gas Company	1	1	0
	E. Foster and Co., Adelphi	21	0	0
	Henry N. W. James, East Greenwich Gas-Works	1	1	0
	Jersey Gaslight Company	10	10	0
	Harry Morris, Jersey	1	1	0
	Otley Gas Company	10	0	0
	Hubert Pooley, Stafford	1	1	0
	Stafford Corporation Gas Committee	5	5	0
	James Whyte, Seaham Harbour	1	1	0
„ 13	R. Birkett, Bromley-by-Bow	2	2	0
	Commercial Gas Company	315	0	0
	Dartford Gas Company	5	5	0
	W. Doig Gibb, Newcastle-on-Tyne	5	5	0
	Ilford Gas Company	10	10	0
	T. S. Lacey, Nine Elms Gas-Works	2	2	0
	William Newbigging, Manchester	5	5	0
	Sevenoaks Gas Company	5	5	0
	Tunbridge Wells Gas Company	21	0	0
„ 14	Brighton and Hove Gas Company	52	10	0
	Archibald Caddick, Croydon	1	1	0
	A. Edwards, Taunton	1	1	0
	Hitchin and District Gas Company	3	3	0
	W. R. Phillips, Luton	3	3	0
	Ringwood Gaslight and Coke Company	1	1	0
	Taunton Gaslight and Coke Company	5	5	0
	Total	£3931	1	0

American Views on the Livesey Memorial.

The following remarks appeared in the American publication "Engineering Record" on the 30th ult.: "A fitting memorial to the late Sir George Livesey has been authorized by the Institution of Gas Engineers. Few engineers ever achieved the commanding position won by that eminent specialist in everything pertaining to the industry with which he was connected from early manhood. . . . He did more than any single man to make the British gas industry foremost among those of all countries, and to solve the problems of labour and capital in that industry. He had to fight strikes and to fight directors; but he invariably won in the end. As a result, though he made mistakes like any other man, he held during his later years a unique position—being practically at one and the same time the representative of the capital invested in the industry and the representative of the workmen. Though for years he was mainly an executive, he never lost the deep interest of his early days in engineering work, and was always ready to give what help he could to the advancement of gas engineering and all features of scientific research likely to be of help to the industry. It has accordingly been determined by the Institution of Gas Engineers that it should establish as a memorial to him a Chair of Gas Engineering and Fuel at the Leeds University. Nothing could be done that would be more appropriate. He was always adverse to expenditure of money for anything but useful purposes. A statue in his honour, like that recently erected at Heidelberg to Bunsen, would hardly be suitable. On the other hand, a memorial fund to be used in increasing the sum-total of the scientific knowledge on which the gas industry is based, is a particularly good memorial for this noted engineer and wise executive."

We regret to record the death, last Wednesday morning, at the early age of 22, of Mr. Richard Shadbolt, the youngest son of Mr. Robert Shadbolt, the Manager and Secretary of the Fleetwood Gas Company. Deceased suffered from appendicitis, and succumbed to resulting complications. He was Assistant to his father, and was a young man of great promise. He was interred in Fleetwood Cemetery on Saturday afternoon.

THE HOMELESS GAS WORKERS OF MESSINA.

Close of the Relief Fund.

We are pleased to acknowledge the following further contributions to the fund for the relief of the gas-workers who have suffered by the earthquake at Messina—bringing it up to a total of £506 16s. 11d. In publishing these additional donations, we take the opportunity, on behalf of the Continental Union Gas Company, of thanking all those who have subscribed to the fund, which may now be considered closed.

	£	s.	d.
Amount already acknowledged	487	18	11
Mr. A. Dougall, Kidderminster	1	1	0
Mr. Andrew Dougall, Tunbridge Wells . . .	1	1	0
West's Gas Improvement Company, Limited .	10	10	0
Chemical Engineering Company and Wilton's Patent Furnace Company	5	5	0
Ringwood Gaslight and Coke Company. . . .	1	1	0
	£506	16	11

PERSONAL.

Mr. Arthur Charles Ball, Foreman at the Wilmslow Gas-Works, has been appointed Manager of the Laindon (Essex) Gas-Works.

It is announced that Mr. Alex. Bell, sen., the Manager of the Dalkeith Gaslight Company, has intimated his intention of retiring from active work, on account of ill-health and advancing years. In consideration of the esteem in which Mr. Bell is held by his brethren, the Council of the Waverley Association of Gas Managers purpose to make a suitable presentation to him at the next annual meeting, in April.

Consequent upon the relinquishment by Mr. W. A. Padfield of the position of Engineer, Manager, and Secretary of the Exeter Gas Company, to which reference appears later on, some official changes have been made. Mr. Padfield is succeeded as Manager and Secretary by Mr. W. N. Westlake, who has been his Assistant for upwards of twenty years; and Mr. L. Wood, who has been for some time in the Company's service, has been appointed Works Manager.

Those of our readers who attended the meeting of the Institution of Gas Engineers last June will remember that a paper was read by Mr. A. F. P. Hayman, as representative of Mr. Ernest Körting, of Berlin, on the Dessau vertical retorts. Mr. Hayman was also present at the meeting in Dublin the previous year, when he received, on behalf of Mr. Körting, the London Gold Medal awarded to him for his paper on "The Vertical Retort from a Practical Point of View." We are pleased to find that Mr. Hayman was one of the deputation of fourteen, representing the British colony in Berlin, who were received by His Majesty the King immediately after his arrival at the Embassy on the occasion of his visit to the German Emperor last week.

The Council of the Royal Society of Arts attended at Marlborough House last Thursday morning, when the Prince of Wales, the President of the Society, presented the Albert Medal to Sir James Dewar, F.R.S., "for his investigations into the liquefaction of gases and the properties of matter at low temperatures.

We regret to learn that Mr. William Langford, the Gas and Electricity Engineer to the Corporation of Longton, and President of the Midland Association of Gas Managers, has sustained a severe bereavement in the loss of his wife, who died, after a rather long illness, on Sunday, the 7th inst. The deceased lady was highly respected by a large circle of friends. Much sympathy, which will, we are sure, be shared by his professional colleagues, is expressed for Mr. Langford and his family in their trouble. The funeral took place last Wednesday. The first portion of the burial service was conducted at the Stafford Street Wesleyan Church, where, as well as at the Cemetery, there was a large gathering of sympathizing friends. Among the numerous floral tributes was one from the employees of the Corporation Gas and Electricity Department.

It is reported that "an informal dinner" was held at the Criterion Restaurant on the 9th inst., at which the formation of an Illuminating Engineering Society in this country was the subject of discussion. No invitation was sent for a "Journal" representative to attend; but it is said that "representatives of the engineering, architectural, medical, and other interested professions, were present." At the conclusion of the dinner the development and progress of the illuminating engineering movement in this country and the objects of the proposed Society—namely, to provide a free and impartial platform for the discussion of questions connected with illumination—were explained; and it was stated that what was proposed was an "Illuminating Engineering Society," and not a "Society of Illuminating Engineers." After what is described as an "animated discussion," warm approval of the suggested scheme, and conviction that the time was ripe for starting such a Society, were expressed.

RETIREMENT OF MR. W. A. PADFIELD.

After a connection of just thirty-seven years, Mr. W. A. Padfield retired last Tuesday from the position of Engineer, Manager, and Secretary of the Exeter Gas Company, and has been appointed to a seat on the Board.

Mr. Padfield began his professional career under the late Mr. Henry Cockey, at the Frome Gas-Works. After spending eight or nine years with him, he held the position of Secretary and Manager of the High Wycombe Gas Company. On leaving the Company in 1872 on being appointed Secretary and Manager of the Exeter Gas Company, the Directors presented him with a handsome testimonial in recognition of his abilities and of their appreciation of his work, and expressed deep regret at parting with him. Six years after he went to Exeter, it was necessary for the Company to apply for an Act of Parliament, and, though they were very strongly opposed by the Exeter Corporation, the Company succeeded, and obtained powers to raise £125,000 of capital, the illuminating power of the gas remaining the same, and the standard price being maintained—Mr. Padfield having succeeded in proving that the Corporation had always been supplied at less than cost price. They, however, asked for a purchase clause, which was granted, and terms were mutually arranged; but this was opposed by the City, and so the matter fell through. In 1882, Mr. Sidney E. Stevenson resigned his position as Engineer to the Company; and from that time Mr. Padfield became responsible for the working of the whole undertaking, which has been uniformly successful. Although the Corporation now use electricity for a great portion of their lighting, there has been a substantial annual increase in the consumption of gas, which amounted to nearly 10 million cubic feet in the year just ended—from 289,284,400 cubic feet in 1907 to 297,930,800 cubic feet in 1908. It may also be mentioned, in anticipation of what is stated below, that the leakage has been reduced from the high figure of 28·01 per cent. on the make in 1872 to 5·27 per cent. last year.

Some idea of the progress made by the Company during Mr. Padfield's connection with it may be formed from the following particulars. When he entered upon his duties as Engineer and Manager, the works were totally inadequate to the requirements; and Mr. Stevenson, who was called in in 1877 to report to the Town Council on the matter, stated that no amount of vigilance on the part of the Manager could secure him from accident by several causes, any one of which might occasion trouble to himself, loss to the Company, and nuisance to all in the neighbourhood. This was borne out at the close of the following year by Mr. A. Silverthorne, who reported that the works were in many instances worn out and very inadequate, excepting in the parts which had been lately renewed; and the distributing plant required enlarging to a considerable extent. To this state of things he attributed the great loss of gas by leakage which then occurred both on the works and in the mains. Under Mr. Padfield's supervision, the works were entirely remodelled and brought up to date, and the result is shown by the following figures. The Company have spent under the revenue account, in excess of the average expenditure of the five years 1868-72, on the repair and maintenance of works, mains, and services, a total of £133,204. This outlay enabled them to add to the efficiency of the works, and to recover a leakage of the total value of £113,849; to make a series of reductions in the price of gas (from 4s. in 1872 to 2s. 9d., 2s. 7d., 2s. 4d., and 2s. 1d. last year), amounting to £246,233; to raise the reserve fund from £4209 in 1873 to £15,188, after paying out of it arrears of dividend to the amount of £3200, or a gain of £10,979; to create an insurance fund of £6505; to raise the amount standing to the credit of the profit and loss account from £4950 in 1873 to £19,787, or a gain of £14,837; and to create a retort renewal account of £12,500—making a total of £404,904. Beyond this, the Company have been able to reduce by £3 1s. 1d. the capital employed per ton of coal carbonized, representing a gain of £89,322 on the quantity of coal used last year. Adding this to the £404,904, we have a total gain of £494,226. Looking at these figures, it is not surprising that after he had been twenty-five years with the Company, they presented him with a service of silver of the value of one hundred guineas, together with an illuminated address, in recognition of his skill as an engineer and his abilities as a financier.

As a parliamentary expert in all cases in which he has been engaged, Mr. Padfield has been uniformly successful; and in one case in which he was associated with the late Mr. Stevenson, they obtained 50 per cent. more than the shareholders had paid into the Company for division among them; it being found that much of the profit due to them had been spent on capital. Mr. Padfield has been equally successful in obtaining good results from all works, whether remodelled or rebuilt or entirely new ones. He left the firm of Messrs. E. Cockey and Sons, of which he was Chairman for seven years, in a most satisfactory condition; having, with others, worked hard in order to make it a real success. He has been connected, in one way or another, with various interests outside his own profession, and has led a most strenuous life.

Mr. Padfield was President of South-West of England District Association of Gas Managers in 1887, and contributed papers which led to useful discussions. He joined the British Association of Gas Managers in 1870, passed into the Gas Institute, and is a member of the present Institution.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 487.)

THERE was a real and substantial improvement last week in the general condition of things on the Stock Exchange. Several influential factors conspired to bring about this pleasant result. Among these were the stronger monetary position and the belief that the Balkan ghost was fairly laid at last. Another cheering item at the start of the week was the successful negotiation of the Indian loan. Thus the opening day was brisk and cheerful; there was good business in the gilt-edged class, with a slight rise in Consols; and the Foreign Market was firm. The same tendency in a more marked degree characterized Tuesday, and business was more active. Consols rose $\frac{5}{16}$; Railways were much firmer; and the Foreign Market was strong. Wednesday was even better still, and prices rose merrily, till it seemed almost like the old times revived. Consols had a big rise of $\frac{13}{16}$; and all the chief departments marched sympathetically. On Thursday, markets were still active and firm generally, but before the close there were signs here and there of approaching reaction through the inevitable realization of profits. This assumed action on Friday, and the upward movement sustained a check. Consols were an exception, and even made a fractional advance. Saturday was rather agitated by the reappearance of the Eastern question, and Home and Foreign Government securities were adversely affected; so that closing prices were below the best of the week. In the Money Market, there was an abundant supply, and rates for loans as well as for discount eased down. But they steadied again, and became firm before the close. Business in the Gas Market was not quite so brisk as in the previous week; and though most of the leading issues were quite firm and many quotations advanced, it was not so with all. This was chiefly noticeable in North of England undertakings affected by the local depression in trade. In Gaslight and Coke issues, the ordinary was pretty active and very firm. Transactions ranged from 103 to $103\frac{5}{8}$ *cum div.*, and from $101\frac{1}{8}$ to $101\frac{3}{4}$ *ex div.*—a rise of $\frac{3}{4}$. In the secured issues, the maximum fetched $87\frac{3}{4}$ and $88\frac{1}{4}$ *ex div.*, the preference $106\frac{1}{2}$ and $106\frac{7}{8}$ *cum div.*, and $105\frac{1}{4}$ and $105\frac{3}{4}$ *ex div.*, and the debenture $84\frac{1}{2}$ and 85. South Metropolitan was very quiet. The prices were $122\frac{1}{4}$ and $122\frac{3}{4}$ *cum div.*, and 120 and 121 *ex div.*—a rise of $\frac{5}{8}$. The debenture made $84\frac{3}{4}$. In Commercials, the $3\frac{1}{2}$ per cent. marked 105, and the debenture $81\frac{1}{2}$. The Suburban and Provincial group were more than usually quiet. British was done at $42\frac{1}{2}$ and $42\frac{3}{4}$ (a fall of $\frac{1}{2}$), Bournemouth "B" at $16\frac{5}{8}$, Ilford "B" at from 105 to $105\frac{3}{4}$, South Suburban at 122, and West Ham at $115\frac{1}{2}$ and 116. Small business was done in the Continentals. Imperial changed hands at from 179 to $180\frac{1}{2}$, ditto debenture at 95, Union at $102\frac{1}{2}$, ditto preference at $139\frac{1}{2}$ and 140, European fully-paid at $23\frac{1}{2}$, and ditto part-paid at $17\frac{1}{4}$ and $17\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres made from $12\frac{5}{16}$ to $12\frac{1}{2}$, Melbourne $4\frac{1}{2}$ per cent. $101\frac{1}{2}$, Monte Video $11\frac{7}{8}$ and $11\frac{11}{16}$, Primitiva $6\frac{1}{4}$ and $6\frac{9}{32}$, ditto preference $5\frac{1}{16}$, and River Plate 14 and $14\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

The General Position—Marking Time in New Constructional Work—A Bright Spot (?) Amid Encircling Gloom—Opportunity a Fine Thing—General Impressions—Time's Changes—Trading in Wiring and Fittings—An Unconvincing Critic.

THE useful tables annually published by the "Electrician," which enable a comparison to be made of the position of the electricity supply industry, are again in hand. The movement of the part of the industry in which we are interested has not been of a surprising character. The only surprise is that, after so much bombastic talk over isolated successes under special favour, and after the strenuous energy put forward to increase business by the circulating of literature and posters with untruth predominating over truth, the industry should be able to record such poor progress in number of consumers and connections generally. The advance that has been made is, in greater part, due to the addition in motor connections in the industrial centres. The tables indicate that there are now 267 undertakings without tramway loads, including some half-dozen stations that did not appear a year ago. Arbroath and Paignton, however, are the only two that can really be called new. One of the others is Wednesbury, which previously obtained a supply in bulk. Bridgend and Neath have purchased dismembered portions of the undertaking of the South Wales Power Company, to whom fate has been cruel; while Chichester and Rawtenstall should really have found place in the tables twelve months hence, as being more applicable to the current year than to the past one. Some thirty stations are announced as being projected or in course of erection (including Rawtenstall); but it is quite evident that another twelve months' record will not show any considerable proportion of these schemes under weigh. It is also found that 196 undertakings supply both lighting and tramway loads. Some 36 towns take electricity in bulk; and there are 19 other instances of progress or project in this direction. Consider these figures, and the number and immensity in capacity of the electrical plant manufacturing concerns in existence, with the comparatively slow rate of progress that is, taking the industry through, being made (other than in highly favoured places) in connections for domestic purposes, and there is revealed the secret of the perilous condition of certain of the manufacturing undertakings. The first growth of the electrical industry was at too great a rate.

"The general increase in connections is a bright spot amid much gloom," writes our contemporary in commenting on the tables. The total municipal and company connections in London and the Provinces at the end of last year was equal to 1,159,890 kilowatts, to which has to be added 158,780 kilowatts representing the power company connections—making together 1,318,670 kilowatts, against 1,250,066 kilowatts in 1907, and 1,091,315 kilowatts in 1906. The increase of 1907 upon 1906 was therefore 158,751 kilowatts, against an increase of 68,604 kilowatts in 1908 over 1907. The inclination of the rate of increase in kilowatts is not, in our opinion, such as to afford any particular satisfaction. Looking at the position of affairs generally, it is pretty evident that the metallic filament lamp is having one anticipated effect, but not another to the extent that was expected. There is no doubt it is causing a loss in consumption; but it is not having such an effect as was hoped in cutting into the private lighting business of gas undertakings. On the contrary, the metallic filament lamp must have suffered vast obstruction from the improvements effected in the inverted gas-burner, which can be obtained at a much cheaper rate than the metallic filament lamp, and then lasts for years—only the mantle and not the whole lamp (as in the case of metallic filaments) requiring renewal. What is more, a goodly number of electricity undertakings have found that a line must be drawn between profitable and unprofitable consumers. The metallic filament lamp reduces consumption; and where the consumption is of the lean kind, there the expenses per consumer are out of all proportion to the expenses that are incurred in supplying him.

But the "Electrician" remarks that "any reduction in the number of units sold for lighting purposes is *likely* to be counterbalanced *in some cases* by the increase in the motor load; a considerable addition to the horse power of motors installed being recorded in the tables." Further "this branch of electricity supply has certainly proved very encouraging to those engineers who have paid attention to the development of the power load." The qualification "in some cases" is a prudent one, as the tables show in the columns devoted to motors that the towns are few in which the field for power development is on the large scale; and the towns are predominant in which all the attention that it is possible to give will not develop any considerable power load, owing to the fact of the absence of industries requiring power. The station engineers in such districts will read with sickly smile the generous and well-intentioned words of hope and encouragement as to the counterbalancing of the diminution of the loss of lighting units by an increase in the motor load. As a matter of fact, the motor load in some places is of such a pigmy character that it does not even pay to make provision for its supply in the daytime; and, moreover, a low power load at a low price per unit does not do much towards compensating for the loss of lighting units at a much higher price. There are residential towns in which the electricity stations doing a slender business have had their peaks beheaded, little day business has been secured, and the plant and capital are not put to such good use as formerly—due solely to the metallic filament lamps displacing carbon filaments, without annexation of new custom.

The greater proportion of electricity undertakings without tramway loads are of the smaller order; and it is only in the larger cities and towns that any notable increase of consumers can be traced. Looking under public lighting, the figures show the effect of municipal ownership; for in a majority of the cases where the word "none" appears, the electricity supply is in the hands of a company. Nernst lamps are disappearing from public lighting; and where carbon filament lamps are in use, there are indications of the advancing supersession by metallic filaments. The number of places, too, in which a few metallic filaments have been put into the public lamps speaks of the tentative efforts of station engineers to convert the public lighting authorities to a favourable regard for these lamps for street purposes. Where this is the case, gas managers should advise the spending of the small amount necessary to fit up lamps with suitable inverted gas-burners. The motor connections in industrial areas exhibit progress, but not elsewhere. The power saturation line is soon reached in the rank-and-file of the concerns. For lighting purposes, the prices charged, comparison shows, have not been varied much. With the adoption of lower consumption lamps, and the extreme indulgence in the matter of price shown to power users, the lighting consumers must be content with present charges. There has in cases been minatory talk of increases in price, by way of penalty upon consumers for getting greater illumination for a less consumption.

Time brings changes. Every town at one time preferred to have its own generating plant; now there is in some districts a greater inclination to patronize the power companies, taking from them the whole supply or any excess required beyond the capacity of the local generating plant. The "Electrician" points out that the Corporations of Middlesbrough and Tynemouth have been unable to resist the offers made by the large Power Companies operating in their districts. Of course, the Companies are in an exceptionally favourable position for power business; but whether even for them things are going to work out precisely as they would like, is still an open question. Our contemporary

is of opinion that the power companies will still further reduce their works costs by the latest development—the utilization of the waste gas of coke-ovens, &c., as is being done on Tyneside. The favourable condition in this regard is the presence of coke-ovens and blast-furnaces; and coke-ovens and blast-furnaces do not exist in all places where Electricity Power Companies are tempting good fortune, but in respect of certain of them have only had the response of bad fortune. In another connection, the thin end of the wedge of a change has been introduced. At one time (reminder is given by our contemporary) central station engineers regarded the tramways load as an important addition to the existing lighting and power load; but in some cases now this position is being reversed. At Cardiff, for example, the Corporation Tramways Department supply to the Electric Lighting Department at 0·8d. per unit. Traction and power supplies bid fair to become the substantial part of the electricity industry's business in certain areas of the country, and in comparison lighting will there take a secondary place. But as this state of things expands, in some districts there are also likely to be certain financial developments that will cause an amount of uneasiness among the ratepayers.

The opposition of the Electrical Contractors' Association to the trading in electrical wiring and fittings by corporations it will be remembered bore fruit in the adoption by Lord Onslow of a model clause for Bills and Orders, which is intended to restrict such trading to the spending of money through contractors, and to ensure that the outlay shall be fully met by revenue. But model clauses are not sufficient without constant watchfulness to see that Bills or Orders are not run through Parliament that do not fully comply with the rule of the Houses as reflected by the model clauses. The Hon. Solicitor to the Association (Mr. R. Tweedie Smith) finds that certain of the Bills promoted by corporations for the coming session either do not comply with the model clause, or the clause is omitted altogether. The Association are trying to arrange matters with the promoting authorities; but where the latter show any obstinacy, the Association are taking steps to oppose their Bills. With the model clause at their backs, the latter are in the stronger position. The Todmorden Corporation ask for sanction to trade in wiring and fittings; and they have been forced to give an undertaking to modify the clauses as they appear in the deposited Bill. This year, possibly through counter influences, the clause has been somewhat modified; but the Association are not without hope that it will be strengthened in the interests of electrical contractors. The Bills to which opposition is to be offered, if there is not amendment, are those of Salford, Oldham, Cardiff, Shrewsbury, Heywood, Mountain Ash, and Watford. The Leicester branch of the Association have also taken action against the Corporation in respect of municipal trading; and it is to be adjudicated upon by way of a special case. From a recent notice in the "Memoranda" of Local Government Board inquiries, it will have been gathered that the Board are likewise giving support to the cause of the Association by declining loans for wiring and fittings where there are no specific powers to indulge in trading in this way. They have shown clearly they will not tolerate such illegality.

Signing himself by the algebraic symbol of the unknown quantity, a correspondent in the "Kentish Gazette and Canterbury Press" refers to our criticism of certain statements made, at a recent meeting of the Canterbury Board of Guardians. The subject, it may be remembered, was the lighting of the Canterbury workhouse, together with the open declaration by Messrs. Urry and Paine as to the righteousness of the modern growth from municipal trading of the opinion that the only consideration for them as Guardians was that, the electricity supply being under the management of the Corporation, they, as trustees of the public purse, should allow the question of economy and efficiency to be blown to the winds, and adopt electricity for the workhouse without further question. That is the only construction their argument and actions will permit. We do not mind the correspondent of our contemporary hiding himself behind the symbol of the unknown quantity—more especially as the character of his letter does not suggest that he is a quantity that we need fear to reckon with. It is one thing to write that an argument is "not very convincing;" but it is another thing to show wherein the weaknesses exist by discussing the points raised. This "X" does not do; he satisfies himself, though possibly not other people, with the quoted phrase. The use of the word "very" suggests that our argument was convincing in a degree, but not completely, so that our unknown critic may be confidently invited to deal with the matter a little more fully. There is one point in his letter which can be immediately dealt with. "I wonder," he remarks, "what the writer would have said had the town owned the gas undertaking, and a company the electricity works, and the proposal had been to substitute gas for electricity." He need wonder no longer. If electricity supplied by the company could show, light for light, economy and efficiency over the municipally supplied gas, the whole foundation for our argument would have been cut away; and without a sure foundation, we should not have attempted to construct a case, knowing that it could have been shattered like a house of cards. We have always said in the case of a municipally controlled electricity undertaking, that any patronage through the ratepayers' money could not be opposed if, in the first place, the charge for electricity was on a paying basis—that is, a basis including capital, generation, distribution, establishment, and management costs—and, in the second place, all the expenses being included, there was greater economy and efficiency in use than could be obtained from gas. While on this point, we observe that in the year ending March, 1908, the Canterbury electricity works sold (according to the "Electrical Times" returns) 651,078 units. The interest charge for the year was £1634; and the amount provided for the sinking fund £2290. These two items represent 1·44d. per unit sold. The total costs per unit were 1·48d.; so that these two items amount to 2·92d. The average price obtained per unit was 2·85d.—0·07d. per unit over 651,078 units below cost, including capital charges. The undertaking is credited with having had a surplus of £73! The charge to private consumers was 3·19d. per unit, and for public lighting 2·10d.; so that, on the above figures, private consumers of electricity were paying something towards the public lighting in addition to what they paid through the rates.

PROSPECTS OF GAS COMPANIES.

In the current number of the "Investor's Chronicle," Mr. Geoffrey M. Gill, who is connected with the Commercial Gas Company, has an article on the above subject. He says the current year, so far as gas companies are concerned, is likely to prove an eventful one, with a continued record of uninterrupted, although gradual, progress. The fall in the price of coal, amounting to about 1s. 6d. per ton, since the last contracts were settled in the spring of 1908, is a favourable feature, and will have a noticeable effect on balance-sheets and dividends. He points out that by modern retort-house equipments and vertical retorts wages are reduced and the make of gas increased; while the residuals are improved in quality and augmented in quantity. The labour conditions in gas-works are entirely satisfactory, thanks to the admirable system of profit-sharing or co-partnership introduced by the late Sir George Livesey, which has been adopted by the Metropolitan and other gas companies. Though the passing of the Coal Mines (Eight Hours) Bill is an adverse factor, Mr. Gill does not consider its effect will be what could be termed "important." He regards the outlook of the gas companies in the matter of sales as favourable. not so much in the demand of their commodity for lighting as for heating and culinary purposes; and he points to the large amount of energy now being displayed in attending to the demands of the gas-consuming public.

In order to show that the consumption of gas is growing in a satisfactory manner, Mr. Gill gives the following figures:—

	1907.	1908.	Inc. p. Ct.
Make of gas in millions	188,733	193,826	2·7
Number of consumers	5,819,941	6,134,739	5·4
,, cookers in use	2,186,698	2,396,058	9·5
Public lamps lighted by gas	706,226	722,089	2·2

He directs special attention to the marked increase in the number of cookers, which he regards as, from all points of view, "the most remunerative consumers." Other satisfactory features are an increase of 10¼ per cent. in one year in the number of prepayment meters and an additional 16,000 public gas-lamps in use.

The author concludes by referring to the almost universal, though moderate, appreciation in gas companies' securities during the past year; and he thinks there is nothing to prevent this tendency from proceeding during the current twelve months. At the end of the article he gives a list of about a dozen gas companies whose securities may be said to have attractions at the present time, from the point of view of safety, yield, and prospects.

"Transactions" of the Institution of Gas Engineers.

We have received the "Transactions" of the Institution of Gas Engineers for the past year. The volume contains a full report of the proceedings at the annual meeting held in London in June, under the presidency of Mr. W. Doig Gibb, of Newcastle-upon-Tyne, and short accounts of the visits paid to the Franco-British Exhibition, Berlin, and Brighton in connection with it, as well as of the visit of the members of the Société Technique du Gaz, who were entertained at luncheon by the Institution. The report which appeared in the "Journal" of the proceedings at the meeting held in December to consider what steps should be taken to perpetuate the memory of Sir George Livesey is reproduced, under acknowledgment. The contents of the volume include, as usual, abstracts of technical papers bearing upon gas which appeared in various publications last year; and notices are given of the deceased members of the Institution—that of Sir George Livesey, which stands first, being an abridgment of the memoir which appeared in our columns. The other matter consists of lists of officers and Council, Committees, recipients of the Birmingham Medal, members, and officers and Committee of the Benevolent Fund. The volume, which has for a frontispiece a portrait of the President, has been produced under the editorship of Mr. Walter T. Dunn, the Secretary.

Recent Wills.—The late Mr. Walter Fiddes, of Clifton, Bristol, whose death, in his 84th year, was recorded in the "Journal" for the 17th of November last, left estate of the gross value of £19,459, with net personalty to the amount of £18,298. Alderman Thomas Crawford, the Chairman of the Walker and Wallsend Union Gas Company, left estate valued at £16,821 gross.

ROUND THE WORLD—AND SOME GAS-WORKS.

By Maurice Graham.

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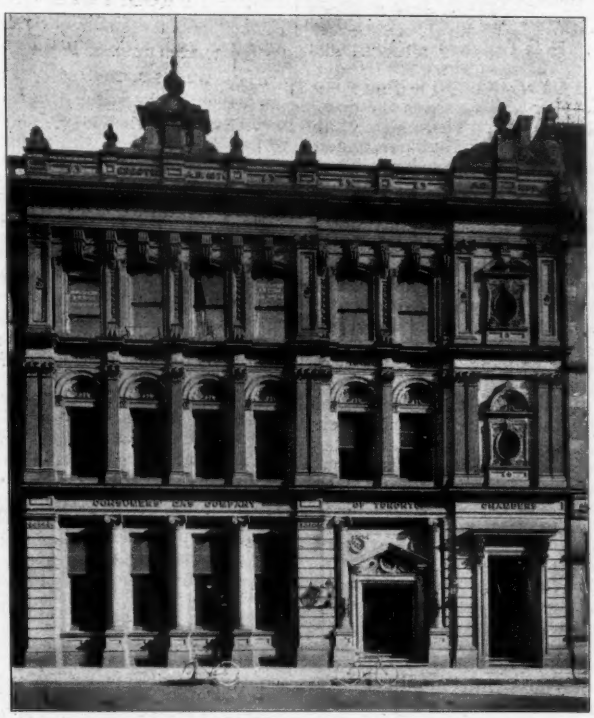
XXII.—TORONTO.

The journey from Winnipeg to Toronto occupied two nights and one day in the train. The scenery was truly beautiful, as the fallen snow covered the ground and tipped the trees—making a lovely wintry scene. The cold was intense; and here and there snow drifts had formed, but not large enough to block the passage of the railway express. The impression upon approaching the town of Toronto was that of a busy manufacturing English town with an immense area of railway sidings.

THE CONSUMERS' GAS COMPANY OF TORONTO.

Without wasting time, a call was made upon Mr. W. H. Pearson, the General Manager and Secretary of the Consumers' Gas Company of Toronto. This gentleman gave the writer a cordial invitation to visit the Company's works, the show-rooms, and meter-shops, and offered any and all information with reference to the Company's methods, an offer which was readily accepted. Mr. Pearson entered the Gas Company's service 54 years ago, when the concern had only been established six years—in 1848. He is an example of one of the most painstaking, energetic, and successful managers ever known in the gas world. Alert, brisk, business-like, with a pride of organization and orderliness, coupled with a kindly manner. This only partly describes the gentleman who is the guiding spirit of this unique and prosperous Canadian concern.



Photograph No. 183.—Offices of the Consumers' Gas Company of Toronto.

Excellent Offices.

The offices are situated in the centre of the city, and, as will be seen by Photograph No. 183, form a substantially built stone structure of imposing design. Upon entering, the first impression is that one is inside some palatial banking house, with its numbered "receiving" or paying-in slides, and its elegant brass railing or grille-work enclosing the official counter, as shown in Photograph No. 184. Within this, the whole of the clerical staff is arranged; each member occupying a small, separate desk forming one unit of the system. Every method to save time and obtain accuracy is adopted; the mathematical machine calculator being responsible for adding up all columns of figures and of amounts collected during the day. Mr. Arthur Hewitt, the Assistant General Manager and Secretary, and Mr. Pearson's right-hand man (whom the writer had the pleasure of meeting in the offices), was of opinion that the introduction of the machine calculator simplified the work in the office, as all calculations were done at the close of the day, besides which the general work of the audit was reduced.

Station "A."

The first works to be visited were those known as Station "A," which occupy an area of about 15 acres. The buildings are well built in brick and well-designed in character, and form the frontage to five streets passing through the Company's property.

The retort-house equipment comprises twenty beds of sixes and twenty-eight beds of nines; all retorts being singles and 9 ft. 6 in. long. The house is of the stage-floor type, and is fitted with Bronder's steam drawing and charging machines, which serve three tiers of retorts in one operation. This system has been working in America now for many years; the writer having seen it years ago in the Philadelphia Gas-Works. One stoker, whose pay is 9s. per eight-hour shift, attends to 60 retorts, drawn and charged by two machine-men. The heating of the retorts is on the American recuperative system designed by Mr. Bredel. In general, the heating was very good; the charges being of 350 lbs. of coal every five hours for each single retort, with a fuel consumption of 16½ lbs. of coke per 100 lbs. of coal carbonized. The clinkering is done by men apart from the stokers. The coal used is from Pittsburg; and there is storage capacity on the works for 14,000 tons.

The hydraulic mains are in separate units for each bed; and a foul main collects both gas and tar from each retort-bed as usual.

The coke, when drawn, falls into a Bronder coke-conveyor,

Photograph No. 184.—Interior of the Offices—The Receiving Department.

Photograph No. 185.—Outside View of the Retort-House and Producer-House at the New Works, Station "B."

which runs under the stage-floor. It is designed on the pan-carrying system, and does not drag the coke along the trough. Here the hot coke is quenched, and delivered on to a centre inclined coke-conveyor of the same type, which carries the coke to the large storage bunkers across the yard. There is no yard coke-heap; all coke finding its way to the overhead bunkers, under which are fixed a large number of charging shoots and revolving fillers for filling sacks. The coke, screened and sized into various bunkers, commands the price of 25s. 3d. per ton.

One now enters a large building containing six annular condensers by Dempster, three water-tube condensers, three Livesey washers, and other plant. Crossing the street and passing through the pump room comprising two large pumps and five tar and liquor pumps, the exhauster-house is entered, where three of Dempster's reciprocating exhausters, each of 80,000 cubic feet per hour, are working with steady gauge.

Out in the yard, a large, tall circular building with a roof over it, looking like an enormous kiln, turns out to be a Dempster tower-scrubber encased all round with a brick building so as to protect it from the weather and from the low temperature, which is sometimes 20° below zero.

Again approaching the street, the large and well-designed purifier-house is entered. This is of the stage-floor type, having eight large boxes, about 40 feet square, with water-lutes. The house is provided with large overhead cranes; and the oxide is elevated from the floor below and fed into the purifiers as usual.

Two large Parkinson station meters measure all the coal gas. They are in close proximity to a splendid and well-arranged large governor and valve room.

Towering far and away above everything are the large gas-holders with outside framing, to the number of seven in all, having a total capacity of 6½ million cubic feet.

The water-gas plant is a special feature of this Company's works, as all the world knows of the combination of Merrifield, Westcott, and Pearson, the last named of whom is connected with this Gas Company. As one would imagine, the carburetted water-gas plant is admirably equipped. Coal is the only fuel used. The capacity of the plant is 6 million cubic feet per day; the apparatus being kept in regular use. It bears the name plate of the Economical Water Gas Company, Limited, Toronto and London. The accessory apparatus for this plant consists of seven water-tube condensers; two Waller exhausters, each for 70,000 cubic feet per hour; six tower scrubbers; eight purifiers in a well-equipped stage-floor house; and three large meters. It would be idle to enter into any further description of so well-known a system of water-gas manufacture and plant, and therefore, with this record of satisfaction, it may be left.

The Michigan Ammonia Works take all the ammoniacal liquor produced and work it up. The tar is also disposed of in a similar way.

"Come and see our mechanics' shop," said Mr. Charles Lemon, the Superintendent of Station "A," who has seen twenty-five years' service with the Company. So the writer went and was astonished to find a large shop with about fifty men working on all sorts of new gas plant and accessories. This machine shop was, in fact, quite as large as one sees in many a contractor's works.

In concluding this visit to the works, it only remains to record that their maximum daily production of gas is 7¼ million cubic feet, with an annual output of approximately 2006 millions.

Station "B."

The writer next wended his way to Station "B," the nearly completed new coal-gas works, which are situated about two miles from Station "A." The site is an ideal one for new gas-works; and it has been laid out in an efficient manner by the Company's Chief Engineer, Mr. W. H. Pearson, jun. The railway lines or tracks are so arranged as to be of the greatest service to all parts of the works, and to facilitate to the utmost the transport of materials. All the walls of the buildings are of red brick, relieved here and there (as will be gathered from subsequent photographs—more especially No. 188) with neatly shaped stone cornices.

It is not the writer's intention to describe in any detail these new works, as he prefers to leave that in the hands of one better able to dwell upon them and the working results. He will, therefore, confine himself to a note of his walk round the works. Upon entering the yard, the general arrangement of the new works is apparent to the visitor. The offices are of good design, as well as being neat and serviceable. The coal-stores, which have a total capacity of 30,000 tons, are entirely automatic; being equipped with a double row of gravity bucket conveyors, so arranged that they receive the coal from large crushers, and distribute it automatically throughout the stores. On their return, they travel in a tunnel under the floor, and can be filled at many points along the length of the house, delivering their loads on to other conveyors, which, in turn, fill the large coal-storage bunkers fixed overhead in the retort-house. All the conveyors are interchangeable as regards delivery and direction of travel of the coal; so that every precaution is taken in case of emergency.

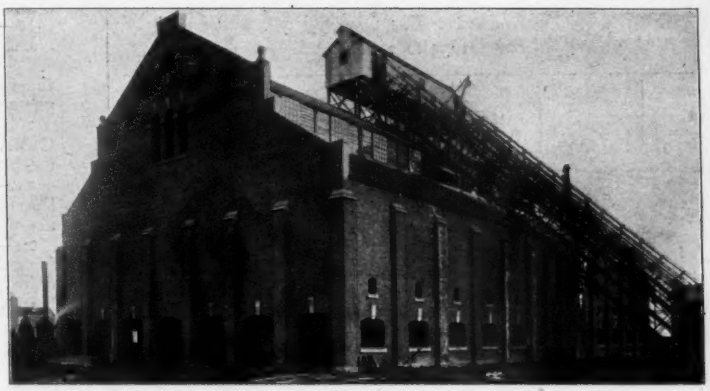
The retort-house, the exterior of which is shown in Photograph No. 185, is a fine long building. Its interior, seen in Photograph No. 186, is full of interest, and comprises a large installation of 18 beds of twelve single retorts in a bed, 9 ft. 6 in. long, and 26 in. by 16 in. Ω-shaped, with rounded corners. The whole of the coal-bunkers (also seen in the photograph), steel structure, stage-floors, staircases, together with all the retort and furnace fittings, besides the complete arches and regenerative settings and

Photograph No. 186.—Inside the New Retort-House—Eighteen Beds of Twelves.

three Wilson producers, were designed and erected by Messrs. Drakes Limited, of Halifax. It all forms a splendid piece of work, as can be gathered from the photograph, and it does that well-known firm of contractors great credit.

The three Wilson producers are located in a separate red brick building of very neat design, which is seen alongside the retort-house in Photograph No. 185. The gas from the producers is conducted through brick-lined steel pipes, across the end of the bench and on the ground-floor level, so as to be easy of access. Longitudinal lines are taken off this main and run lengthways down each side of the bench. From these, each bed takes its supply. Valves are placed at suitable points for either entirely shutting off or regulating the supply of gas.

The charging and drawing machines are on "Bronder's system." They are made to draw and charge four retorts at a time. The whole of the coal and coke conveying machinery—the latter of which, with the coke house or stores, is to be seen in Photograph No. 187—is also of Bronder type; the general arrangement being similar to that installed at Station "A."



Photograph No. 187.—Coke-Conveying Plant in Course of Erection and Coke Stores.

The fine boiler-house is equipped with three Polson water-tube boilers, which are fed from overhead bunkers supplied with coke by a separate conveying plant. The gable end and tall chimney of the boiler-house appear in Photograph No. 188, which gives a good view of the pleasing building containing the condensers, tar-extractors, and washers. Before this is reached, however, the lofty exhauster-house must be noticed, with its two Waller exhausters, each 125,000 cubic feet per hour capacity.

An interior view of the condenser and washer house is given in Photograph No. 189. The apparatus contained in it is two air-tube and two water-tube condensers; two of the Pelouze and Audouin tar-extractors; two Livesey washers; and two Holmes washer-scrubbers. It will be observed that all the gas-pipes are in sight and uncovered in case of emergency.

The uniquely-designed building illustrated in Photograph No. 190 is the purifier-house, and contains four large purifiers suitable for the 2½ million cubic feet unit of the works. The boxes are on a stage-floor, and are on the dry-sealed system, with the latest improvements.

All these buildings and plant go to make up these completely new gas-works, which constitute the largest coal-gas plant ever erected at one time in Canada. It is work of which Mr. W. H. Pearson, jun., should be proud. Owing to his absence through being unfortunately ill, Mr. A. G. King, his Chief Assistant, was deputed to conduct the writer round the works, which he did in an exceedingly interesting manner, showing, by his knowledge of the plant, that his services were bound to be of considerable value to his Chief when all the apparatus is working. This was expected early this year; and the results, especially of the carbonizing plant, will be of the greatest interest, and the returns should be of the very best.

The plant has been completed throughout on a unit basis of 2½ million cubic feet per day, though the buildings are all designed for apparatus of just double that capacity.

Photograph No. 188.—Condenser and Washer-House; also End of the Boiler-House and Chimney.

Photograph No. 189.—Apparatus Inside the Condenser and Washer House.

Gas Consumption.

The total length of gas-mains is 361 miles; no high-pressure pipes have been introduced as yet. The illuminating power of the gas sent out is 20 candles; and there are no sulphur clauses to be bothered with.

The competition with electric light is very keen; but the Gas Company more than hold their own with gas at 3s. 1½d. net per 1000 cubic feet, compared with electricity at 8 c., or 4d., per unit. The public lighting is partly done by incandescent gas; but there are only 1063 lamps erected for street illumination.

All meters are dry; and of slot meters there are none, as the writer was informed there was no demand for them. No meter-rents are charged, but 20 c. or 10d. per foot is charged from the street main to the meter. There are sold and in use 32,000 gas-cookers, stoves, and heaters of all sorts; and about 160 gas-engines. Out of a population of 320,000, there are 54,000 consumers; but these are going to be largely increased by a system explained by Mr. Hewitt, which will result in the present annual increase in gas consumption of 13 per cent. being still further augmented.

To show the rapid growth of the Company's business, some figures of the undertaking throughout six decades and in the year 1908 will be of interest—see p. 446.

Prior to last year, the Gas Company did not take much interest or initiative in the sale of gas-fittings, cookers, and heaters; but owing to the fact that they have now realized that most of the complaints of gas supply arise through unsuitable or defective fittings and apparatus sold by outsiders, the Company very wisely decided to put upon the market, for the benefit of their consumers, one or two of the very best types of each class of fitting or appliance.

The British Commercial Traveller.

It must not be forgotten that the Canadian is very

Progress of the Consumers' Gas Company of Toronto from 1855 to 1908.

Year.	Population.	Increase per Cent.	Gas Output in Thousands of Cubic Feet.	Increase Per Cent.	Miles of Main.	Price of Gas per 1000 Cubic Feet. $
1855	42,500	..	22,000	..	23	3·00
1865	47,500	11·7	30,014	36·4	41	3·00
1875	68,678	44·6	100,122	233·9	66	2·50
1885	105,211	53·2	273,484	171 1	126	1·15
1895	190,000	80·6	614,553	124 7	227	1·05
1905	250,000	31·5	1,374,114	123·6	302	0·80
1908	320,000	10·4	2,006,804	13·2	361	0·75

The increases shown for 1908 are as compared with the year 1907.

sensitive, and does not like any domineering spirit to be shown by commercial travellers, representing that their British goods are the only ones that are any good. This, from information given to the writer, is one of the reasons of the comparative failure of the British commercial traveller in Canada. The people do not relish the bull-dogged, good-hearted, fatherly methods of the British commercial, who looks upon them as Colonials made to be taught something by an "Old Country" specialist. While the writer was in the show-room of the Gas Company, there entered an English traveller, who showed his goods to the Manager of the department. The Englishman's principal remarks consisted in saying: "These are the best and latest styles and designs by our English experts, &c., &c." He was surprised when he was met with the quiet observation that they were not what were wanted by Canadian consumers. The man did no business.

British or American Methods.

British firms must remember that Canada is only a train ride from New York and from the leading manufacturing centres of the United States, and, therefore, Canadian gas managers are educated on American commercial lines. The writer admired Mr. Hewitt's plain and straight talk to him on the subject of British and American commercial gas methods. He said:

1.—British gas-fittings are far superior to American in finish and workmanship.

2.—In regard to catering for the wants of the Canadian, the American design is better than the British.

3.—For instance, his consumers insist on having lamps and fittings fitted with automatic switches and bye-passes, and all such little conveniences which tend to make the lighting of lamps easy.

4.—American manufacturers excel in these particulars. They make all classes of the neatest lights ready to be switched on by chain or pneumatic buttons. They study the convenience of the user, and make this one class only.

5.—British manufacturers study the user's pocket too much, and insist on telling him that he must have so and so, or it will cost him too much.

6.—In America and Canada, that method is wrong, because money is more plentiful, and people want something that will give them as little trouble in lighting as possible.

7.—The usual British incandescent burner, whether vertical or inverted, is not as a rule provided with a bye-pass just because it is cheaper to sell and has to be lighted by a match. Lighting-back in wooden houses, as used in Canada, is a great source of danger.

8.—The less the British manufacturer tries to push the cheap British or German fittings the better.

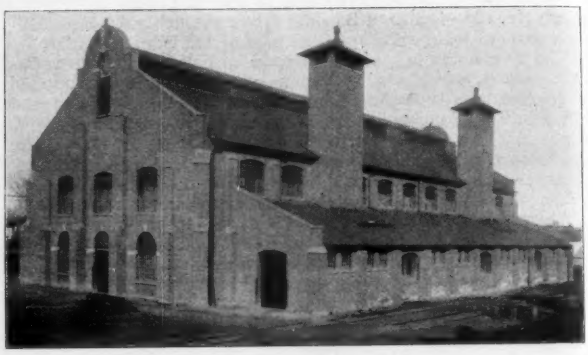
9.—Comfort, reduction of labour, annoyance, and risk, are the essentials sought after by the Canadian and American gas consumer.

10.—Canadian gas managers are members of the American Gas Associations, and visit American cities and imbibe their methods of lighting and heating from them.

11.—All tubes and pipes used in Canada have American threads; so British goods will not fit them, unless the fittings are provided with two threads.

12.—American glass manufacturers supply the same globes for gas-fittings as for electric fittings, so that it is difficult to distinguish one from the other when lighted. This is a great help to gas in regard to the sale of fittings.

It, therefore, behoves British gas-fittings' manufacturers, and others who want the Canadian trade, to give what the consumers insist upon; and it must not be forgotten that Canadian families keep few servants or helps.



Photograph No. 190.—The Purifier-House.

The writer considers that Colonial gas companies are far more willing than the average British gas company to attend to the consumers' requirements and suggestions. He also thinks that the Canadians are quicker in action and deed than the average Englishman, perhaps because of the hustle the former are daily brought in contact with from the United States.

Mr. Hewitt mentioned that his Company had decided to push the sale of the Humphrey lamp, on a system of maintaining the mantle and cleaning the globe. He anticipated that he would have over 3000 in use within the first twelve months.

The Directors of the splendidly managed Consumers' Gas Company of Toronto have an asset that cannot be beaten in any part of the world. It is encumbered neither by debenture nor by mortgage. As one of the stipulations is that no higher dividend than 10 per cent. can be paid to the shareholders, it follows that the gas consumers get the benefit in the reduction of the price of gas, while at the same time due wear and tear are allowed for, so as to keep the plant in the highest state of efficiency.

In conclusion, it is the writer's opinion that Mr. W. H. Pearson has built for himself in these works a lasting and notable achievement during the half-century in which he has devoted himself to them. It has been a duty to his Company; but it must be a pleasure now to see the fruits of his hard and plodding labours, standing far above other classes of security and investment.

WATER LEGISLATION FOR 1909.

In preceding issues of the "Journal," the principal features of the Gas Bills and Provisional Orders for the session now opening have been noticed. We to-day deal with those relating to water supply; taking first the measures brought forward by Companies.

The Bill promoted by the Aldershot Gas and Water Company is to confer powers in respect of both branches of their undertaking; and those relating to the supply of gas and electricity have already been noticed. With regard to water, the Company require authority to construct additional works, comprising a well and pumping-station, and a pipe-line connecting it with their reservoir-station at Cargate Hill, a covered service reservoir there, and a second pumping-station. Subject to the provisions of the proposed Act, the Company wish to be empowered to take the water from any springs and streams that may be intercepted by these works. It is provided that no wells or similar works are to be sunk by the Farnham Water Company, the Frimley and Farnborough District Water Company, or the Wey Valley Water Company within a radius of three miles from the wells of the Company to be constructed under the powers applied for. The capital is to be consolidated and converted, and authority to raise more is applied for. This portion of the Bill has already been dealt with. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

The Bungay Water Bill is to incorporate the Bungay Water Company, and enable them to supply water in the parishes of Holy Trinity and St. Mary, Bungay, the borough of Eye, and the parish of Mendham, in the county of Suffolk, and the parishes of Ditchingham and Redenhall-with-Harleston, in the county of Norfolk. The capital of the Company is to be £25,000, in £10 shares; and borrowing powers to the amount of one-third are applied for. The Company seek authority to make and maintain a well and pumping-station at Bungay, another at Eye, and a third at Redenhall, together with a reservoir, two water-towers, and several conduits or pipe-lines, and other ancillary works, for the completion of which five years are asked. The charge for water for domestic purposes is to be based upon the rateable value of the premises supplied, with a minimum of 8s. 8d. per annum, and extras for a second closet and every fixed bath. Where the supply is by measure, 2s. per 1000 gallons is to be the maximum charge. Authority is sought for the sale of water in bulk, and for making bye-laws for the prevention of waste, undue consumption, or contamination of the water. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Clevedon Water Bill is to incorporate and confer powers upon the Clevedon Water Company; the present Company being dissolved. The limits of supply are to be the urban district of Clevedon and certain specified parishes, all in the county of Somerset. The capital is to be £60,000, of which £40,000 is to be original, and to be entitled to maximum dividends of 7 per cent. per annum in respect of £29,000 ordinary, and 4½ per cent. in respect of £11,000 preference, and the remainder additional capital, which is to be sold by auction or tender. The dividends

are not to exceed the above-named rates. Borrowing powers to the extent of one-third of the capital raised are sought, as well as for the issue of debenture stock. Authority is required to maintain and renew the existing works, consisting of two wells, pumping-stations, and reservoirs in the parish and urban district of Clevedon, and two aqueducts, conduits, or pipe-lines connecting them. The charges for water are to be based on the gross estimated rental of the premises supplied, and to be 8s. 8d. per annum where this is under £5, and 12 per cent. where it is above this figure, with the usual additions for an extra closet and a fixed bath. The charge for water supplied by meter is not to exceed 2s. per 1000 gallons. The Company seek power to sell water in bulk, supply fittings, &c. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Donington Water Bill is to incorporate the Donington Water Company, and to enable them to supply water in that parish and others in the county of Lincoln. The capital is to be £12,000, in £10 shares; and the usual borrowing powers are applied for. It is proposed to construct a well and pumping-station at Donington, a water-tower on the road leading therefrom to Horbling, and a line of pipes connecting them—all to be completed within five years. The charge for water for domestic purposes is to be based on the rateable value of the premises, with the usual minimum of 8s. 8d. per annum, and extras for a second closet and every fixed bath. For supplies by meter, the maximum price is to be 2s. per 1000 gallons. The Company wish to be authorized to sell water in bulk, supply materials, make bye-laws for preventing waste, &c. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Frimley and Farnborough District Water Company are applying for power to extend their limits of supply so as to include a number of parishes and places in the rural districts of Basingstoke and Hartley Wintney, but in the case of the latter place only with the consent in writing of the Rural District Council. Provision is made in the Company's Bill for the sale by the Council and Baron Calthorpe of their respective water-works and plant in the parish; and also for the use by the Company of lands at Sturt Lane Junction for the purposes of their undertaking, and the maintenance and extension of the pumping-station and other works already constructed by them thereon. The expenditure of capital on these works, as well as on those at Blackhill, in the rural district of Chertsey, is to be sanctioned and confirmed. Authority is sought for carrying out new works, comprising a well (already commenced) and pumping-station in the parish of Odiham, a service reservoir in the parish of South Warnborough, and two pipe-lines. Ten years are asked for the completion of the reservoir and one of the pipe-lines, and half this period for the pumping-station and the other line. The Company require authority to raise additional capital to an amount not exceeding £70,000 by auction or tender; and the limits of dividend upon it are 7 or 5 per cent. per annum, according as it is issued as ordinary or preference. Power to borrow one-fourth of the amount is sought, and also to create debenture stock. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Grantham Water Bill is to confer further powers upon the Grantham Water Company. It is proposed to construct additional works, comprising a dam or weir, with a catchpit or intake and other works in connection therewith, across the Cringle Brook, a reservoir upon the River Witham and adjacent lands, a diversion of the river, and an aqueduct or pipe-line; and a period of ten years is asked for their completion. Confirmation is sought for the construction of a sedimentation reservoir in the parish of Little Ponton, on the east side of the River Witham. It is proposed to appropriate the waters of the Cringle Brook by means of the dam already referred to. The Company's shares are to be converted into 5 per cent. stock, at the rate of £20 of stock for each existing share; and sufficient additional capital to produce, with premiums, £40,000 is required. They ask for authority to raise by loan any sum or sums not exceeding, with the £7200 already borrowed, one-third of the nominal amount of the consolidated ordinary stock issued in exchange for the existing shares; and also up to one-third of the additional capital. Other powers sought relate to the supply of fittings, the sale of water in bulk, and the erection of cottages for the officers and servants. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Pontypool Gas and Water Bill is principally to empower the Company to construct additional water-works and raise further capital. The works specified comprise an intake weir, a reservoir, and a catchwater in the parish of Panteg, a number of pipe-lines and drifts, and a well and pumping-station in the parish of Blaenavon. For some portions of these, however, and others which have been constructed, confirmation is sought. The reservoir referred to is to be so far completed within five years as to be capable of holding not less than 10 million gallons of water, together with one line of pipes; and it is to be finished within fifteen years. The waters of several springs and streams are to be appropriated; and the Company seek to be authorized to enter into agreements with Westlake's Brewery Company, Limited, for the purchase of their surplus water at Cwmavon. They also wish for the repeal, as from Aug. 1, 1914, of section 55 of their Act of 1873, and for the substitution of a provision to the effect that the water need not be constantly laid on under pressure, but be supplied at such pressure as will be afforded by gravitation from the respective reservoirs or tanks from which it is drawn. The other water clauses of the Bill relate to the making of bye-laws for preventing pollution and waste, and give power to the Company to hold lands for the protection of their works, sell water in bulk, sell or let meters, and supply fittings. The clauses of the Bill relating to gas have already been noticed. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Pontypridd Water Bill is to empower the Pontypridd Water Company to construct railways and other works in the counties of Brecon and Glamorgan, and to abandon certain works authorized by their Act of last session. The new works consist of four railways, a service reservoir, two aqueducts, a road widening, and an approach road; and they are to be completed within three years. It is proposed to abandon the construction of the Lan Wood reservoir, the connecting lines of pipes, and the tramroad authorized by the Act already referred to; and compensation to be made in respect of the last-named work. The Company wish to be empowered to enter into contracts for the supply of water in bulk. Certain specified sections of the Act of 1908 are to be amended and repealed. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The South Lincolnshire Water Company are seeking by their Bill to extend their limits of supply, so as to include the parish of Pinchbeck, in the county of Lincoln, and asking for power to construct additional works, comprising two wells and pumping-stations in the above-named parish and a conduit or pipe-line, to be completed within five years. Confirmation is sought for an agreement entered into on March 2, 1906, to purchase the undertaking of the Fen Water Company. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Bill of the South Staffordshire Water Company is to authorize the construction of additional works, to sanction and confirm existing works, and to empower the Company to increase their capital. The new works consist of a pumping-station in the parish of Burntwood Edial and Woodhouses, and another in the parishes of Kingswinford and Kinver, all in the county of Stafford, and two pipe-lines in connection therewith. The works already constructed for which the Company require parliamentary sanction, consist of twelve pumping-stations and four reservoirs. Ten years are required for the completion of the new works. Authority is sought for raising additional capital to an amount not exceeding £300,000, by the issue of ordinary or preference stock, to be entitled to 7 or 5 per cent. dividend according to the nature of the stock. The Company ask for borrowing powers to the amount of £75,000, to be exercised as specified in the Bill; also for permission to create debenture stock—the dividend in both cases being limited to 4 per cent. per annum. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The West Gloucestershire Water Company are applying for further powers in respect of their undertaking. Their Bill extends the limits of supply to the several parishes and places specified, where the charges are not to exceed those paid for a supply of water under similar conditions by consumers in the original area. Additional capital to the amount of £90,000 is applied for, to be issued either as ordinary or preference, and to be entitled to 7 or 5 per cent. dividend. Borrowing powers to the extent of one-third of the new capital, as well as for the creation of debenture stock, are sought. Sanction is required for works already carried out; and power is asked to hold certain lands at Oldland and Bitton, in the rural district of Warmley. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Worksop Water Bill is to authorize the Worksop Water Company to construct additional works and raise more capital; and the Bill they have promoted includes clauses to sanction and confirm certain works already existing. It is proposed to make a well or wells and erect a pumping-station at Checker House, in the parish and urban district of Worksop, and the work for which sanction is required is a well adjoining the existing pumping-station at Sunnyside. Five years are required for the completion of the new works. Authority is sought to raise additional capital to the amount of £32,000, to carry 7 per cent. maximum dividend if issued as ordinary, and 5 per cent. if as preference capital. Borrowing powers to an amount not exceeding £10,000 are applied for, as well as permission to issue debenture stock; the interest on the money raised by these means to be limited to 5 per cent., unless the Board of Trade sanction the payment of a higher rate. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Late Lady Livesey.

Referring, in the current issue, to the death of Lady Livesey, the Editor of the "Co-Partnership Journal" of the South Metropolitan Gas Company remarks: "In October last, when the earth-life of Sir George Livesey closed, the thoughts of all the many thousands of mourners instinctively turned to the chief mourner in the shadowed home at Reigate—the invalid lady to whom for nearly half-a-century he had been a devoted husband, strong protector, and tender companion. It did not need any intimate knowledge of our late Chairman's private life to create the impression that in his home he met with sympathy and inspiration in his many good works. His frequent allusions to his wife, his thoughtful consideration for the wives of the officers and men, and his wise advice in the addresses in which he spoke of home life, all tend to prove that he lived in that 'divine harmony of marriage' which is the greatest earthly help in developing the highest good in humanity. To Lady Livesey, therefore, the loss was more than common, the grief more than usually poignant, and the desolation especially sad."

SUCTION GAS PLANTS.*

As announced in the preface, this book is the outcome of three lectures recently delivered at the East London College, following the delivery of which a great amount of discussion and correspondence took place. In the preparation of the lectures in their present form, the author has been assisted by Mr. Ed. Allcutt, B.Sc., of the University of Birmingham. Assistance has been afforded by numerous firms interested in suction plants; while the columns of "Engineer" and "Cassier's Magazine" have also been drawn upon. As the book consists of less than 200 pages, the reviewer expects to see in a concise form all that is best worth knowing on the subject—an expectancy which is realized.

The first lecture (58 pages) commences with a comparison between steam and gas power. The author once more points out that when coal is burned in boilers for supplying steam to small power engines at least nine-tenths of the heat energy which Nature has stored up for us is wasted. In convincing diagrammatic form is shown a comparison of the losses in suction-gas plants with those in steam plants; the over-all efficiency in the former being given as 19·2 per cent., against 8·7 per cent. in the latter. The author claims that the efficiency of the suction-gas producer may safely be taken at 85 per cent., and that finality has by no means yet been reached. There can be no doubt, however, that a large number of plants at present in use do not come up to this figure. It is one thing to run a plant specially for exhibition purposes, and quite another to put it in charge of a man whose qualifications are physical rather than technical. As the thermal efficiency of the gas-engine is only 30 per cent., the author rightly states that it is to the latter rather than to the producer that we must chiefly look for improvements. The suppliers of "town" gas will at least share in any such improvement.

Passing on to the history and development of the suction-gas plant, a well-deserved tribute is paid to the work of Mr J. Emerson Dowson. On the authority of Mr. W. A. Tookey, we have it that the first suction-gas producer was designed by Dr. Bowman and manufactured by the Dynamic Gas Company, of Manchester, though the credit has been claimed for Messrs. Crossley (1901). There are now actually 25 British designs on the market, and no less than 20 manufacturers. There are 300 plants being turned out annually, which hardly accords with the impression one gets from a well-known railway advertisement that one firm has put "thousands in use." Still, the number is a goodly one considering the brief history of the "suction" principle practically applied. Possibly it accounts for those plants that are silent monuments of sadder but wiser moments, and indications that "town" gas has either been reverted or resorted to. How many more would have joined these degenerates had it not been for the facility with which the turning of a gas-valve or tap will bring friendly communication between the town gas-works and the gas-engine presumably run on suction gas?

The details of construction are lucidly dealt with, and the chemical reactions which take place in the generator are clearly explained. The author is frank enough to point out, on p. 19, that, inasmuch as the incombustible gases which leave the producer are three to four times as much as the combustible gases, a gas-engine working on suction gas will develop less power at full load than when working on "town" gas—a statement which is rarely extracted from the maker who entertains engineering and other societies to lectures obviously written for the sole purpose of effecting suction-plant sales.

Experiments and experience have shown that the higher the velocity with which the air passes through the heated carbon the greater is the proportion of carbonic acid produced; and for this reason the area of the furnace producer in modern suction plants is considerably higher than was at first the case. The great importance of air regulation in the suction gas plant surrounds with difficulties the problem of removing the clinker satisfactorily while the engine is running; and all sorts of devices for performing this operation, without upsetting too much the composition of the gases passing forward, are described. As a coal-gas practitioner would expect, stress is laid on the importance of maintaining the depth of fuel fairly constant, and the author has apparently had his eye on the Woodall and Duckham vertical retort when he says: "It would seem to be an advantage if some automatic arrangement could be devised so that the fuel from the hopper could drop as required to keep the level of the furnace proper always constant." We learn that it is the general tendency of the makers to simplify their plants as much as possible, "since the type of attendant usually in charge is not, as a rule, very skilled." Judged in the light of some of the labour costs as claimed by partizans of these plants, we cordially agree; for the scientific attendant can hardly be had for the money. As the author remarks: "It is impossible to make an efficient piece of engineering apparatus for generating power fool proof." The only plausible alternative is to put it under the control of a wise —*i.e.*, trained—man, and then maybe the ridiculously low labour costs will be modified to such a figure as becomes the intelligent control of an apparatus involving so many engineering and scientific considerations.

The details of several forms of vaporizers are carefully discussed. The chief difficulties in the regulation of the steam and air arise from varying loads. With a light load, there is danger of producing too much steam; the fire is damped down; and the percentage of carbonic acid goes up. On the other hand, if too little steam is admitted, there will be less combustible gas from its decomposition, and also trouble with the clinkering. The use of tubular forms of vaporizers is very properly condemned; for sooner or later trouble is bound to attend them, and the operation of clearing is, as a rule, most difficult. The vaporizer of the Dowson plant, which consists of a double casing round the upper part of the producer body, impresses us as being simple, efficient, and such as will cause a minimum of trouble. The air supply, the water seal, the scrubber, and the expansion box which forms the reservoir between the scrubber and the engine are all adequately explained. Efficient scrubbing is quite as important in these plants as in the cleansing of coal gas. The author states that too much is left to chance in the matter of evenly distributing the water over the coke.

As regards fuel, the author expresses a preference for anthracite. The difficulties with bituminous fuel in this country have not yet been overcome, though several plants are said to be successfully working on the Continent. The chief difficulty is that it cakes and clogs, and the gas when distilled absorbs so much latent heat that a sufficiently high temperature cannot be maintained to compietely convert all the carbonic oxide into carbonic acid. "The problem," says the author, "of the use of bituminous coal is more complicated than it appears, and it would appear that, until the general body of engineers know a great deal more than they do at present about suction gas producers, it is better to use anthracite, except under special conditions." As one never knows what the price of anthracite is going to be, this is not particularly encouraging. We are told that gas coke is used on account of its cheapness, though with a loss of 5 per cent. 25 per cent. more fuel is required as compared with anthracite. Mr. Smith does not make it clear why, under these circumstances, he prefers the latter fuel. Considering the possibility of an outlet for gas coke, gas engineers should at least approach the economical and other aspects of suction plants with an unprejudiced mind. If, in addition to taking coke, they use a substantial quantity of "town" gas to eke out the short-comings of their interior product, they will not be such terrible things after all.

About 16 pages are devoted to the testing of suction plants. Practically all the comparisons made are for "fuel costs only," and therefore are of little value to the man who wants to know exactly what the inclusive relative value really is. Such tests, giving an apparently great advantage for the suction plants, have pretty much the same effect on a power user as the dazzling brightness of a street lamp upon a moth; they flatter but to deceive. These book tests, too, have all been taken under close skilled supervision, and are not comparable with the results obtained by the average user with an attendant who fills up interludes between charging his producer by washing windows or running errands.

This lecture contains no advice as to how to proceed when a plant breaks down. It is assumed, perhaps, that the operator should, after perusing this work, become intelligent enough to tackle the problem himself. At present, the plan usually followed is for the user to communicate, more or less frantically, with the maker, and thereby incur somewhat costly repair charges.

The second lecture does not call for quite such extended notice. It is devoted to the applications and uses of the suction-gas plant; and the author gives particulars of its use for pumping, marine work, &c. It is news to us to learn that suction gas is now being extensively adopted for many kinds of heating purposes where town gas has previously been used. A gasholder and an exhausting fan are required (in addition to the usual units), regarding the capital cost of which nothing is said. Without any evidence in support of the statement, the author says: "In the heating of lacquering stoves, muffles, laundry work, brazing, &c., suction gas is rapidly taking the place of town gas, owing to the economy to be obtained, and the small outlay involved."

With Mr. Smith's general conclusions as to the advantages of roasting and cooking by gas, we are able to agree; but it is as well to put him right on one point. He says: "The products of producer gas are similar to those of town gas, and so cannot do any more harm than the latter. For heating work generally, it is found that about four volumes of suction gas are equivalent to one of town gas." The fact is quite overlooked that it is one thing to get through cooking expeditiously with a calorifically rich gas, and quite another to perform the same operation with a gas containing but 25 per cent. of the heat units in a given equal volume. While in practice the problem of dealing with the products in the former is simple, under normal conditions of ventilation, the use of the thinner gas involves such an increased volume of "products" that the statement as to its being equal in effect is sanguinary in the extreme. The increased volume of carbon monoxide, too, in the suction gas is not likely to commend it; for although it is present only in the proportion of 25 per cent., the situation is vastly altered when this is multiplied by 4—the heating equivalent of town gas.

Following this optimistic vision into the prospects of suction gas for cooking and heating are hints on the working of plants; and they are enough to remove the fallacy that such plants can be satisfactorily managed by untrained—*i.e.*, unskilled—labourers. There is a good deal more than meets the eye in the somewhat cryptic passages: "But the makers . . . seem very willing to give advice in order to keep the plants working efficiently.

* "Suction-Gas Plants." By C. Alfred Smith, B.Sc. (Eng.), Assistant Professor of Engineering at the East London College. London: Charles Griffin and Co., Limited; 1909. [5s. net.]

Indeed, there are few branches of engineering in which such enterprise has been shown in this matter as by makers of suction-gas plants." We quite agree. The enterprise was sadly needed —by the users!

The method of starting the producer is explained, and the risks of explosion if the starting fan be stopped is pointed out. Emphasis is properly laid on the desirability of having the fire-brick lining of the producer tight, and also the joints necessary for coupling-up the various units of the plant. No less than twelve designs of plants are described and illustrated.

The third lecture is devoted to plants for special purposes, and leads off with an essay on the experiences to date with generators designed for fuel containing tar, more especially bituminous coal. There are some interesting remarks on a thesis laid down by Mr. Tait, that "the thermal or calorific value of the gas employed does not necessarily form a true index of the power value of a gas for engine work." Some results are given which apparently support this proposition; but fuller investigation will certainly be needed before people will be weaned from the calorific basis of comparing gaseous fuels for power purposes. This is followed by some figures as to the growth of the suction-gas plant industry, based chiefly on information supplied by makers. In a section dealing with the advantages and disadvantages of such plants, the author makes light of the latter, and extols the former. He says: "But there are often heard warnings of failures, of town-gas connections, of the cost of duplicate plants, and of the dangers of poisoning by gas." As an authority on the subject, he must surely know that there are failures, that there are town connections, that there are duplicate plants, and that there are dangers of poisoning. The liability of suction plants to failure is a most serious one for small manufacturers, and several plants have been discarded on this account alone. The economy or otherwise of suction plants is not to be gauged by a "full dress" rehearsal at an agricultural show, but by the soberer test of (say) two or three years' actual use. Gas engineers may be prejudiced; but they can at least pick up a good deal of information on this score that is denied to the professor within college walls, or in communications he receives from makers of suction plants.

The author falls into a sad error when he says that Mond gas can be generated, distributed, and sold at a profit "at the ridiculously low figure of 2d. per 1000 cubic feet." He had better spend a week-end in the Potteries.

An analysis of the effluent from a gas plant is given, and the objections to turning same into streams or sewers are referred to. From information chiefly supplied by makers, is given a section on "Costs of Production, &c." As a specimen, it may be said that the labour costs on a 115 B.H.P. plant and engine are put down at £52 per annum, or £1 per week. For comparative figures of "Suction *v.* Town" gas, the author strikes the path of least resistance, with an inclination towards "Suction." He quotes from the presidential address of Mr. T. Duxbury last year, and sets against it one of Mr. Hugh Campbell's pet estimates.

We thank the author for the following reference to ourselves: "The following is an extract from the 'JOURNAL OF GAS LIGHTING,' which one scarcely expects to be biassed in favour of suction gas plants. It is, of course, well known as a fair-minded technical journal." The extract referred to extends to two pages, being an article on "Electricity, Coal Gas, and Producer Gas; Its relative Cost for Power," by H. J. Ibbotson, of Newport (I. W.). In the conflicting maze of figures proving both "town" gas and "suction" gas to be cheapest, our sympathies go out to the poor user of steam or "town" gas, who will do well to remain in a state of darkness on the "suction" aspect until those who have already fixed these plants have finished experimenting. The mere fact of numbers in use proves nothing, no more than the vast number of motor-cars proves them to be inexpensive articles. We certainly cannot yet subscribe to the author's ambiguous opinion that, given normal prices and conditions, the suction plant in small units shows a substantial saving over any other means of power production. We should probably differ at the outset as to what were "normal prices and conditions."

The lecture closes with a short reference to the gas-engine; and there are some interesting facts on taking indicator diagrams. A very ingenious device by Professors Callender and Dalby for measuring the temperature in the engine cylinder at any part of the cycle is described.

There are two pages of bibliography, and 41 pages of appendices. The latter describe the determination of calorific values of gaseous and solid fuels, and gas analysis; and there are price lists of suction-gas producers and horizontal and vertical gas-engines up to 300 B.H.P. An interesting chapter on the destruction of tar in the gas-producer is illustrated by no fewer than 16 forms of producers in sectional elevation.

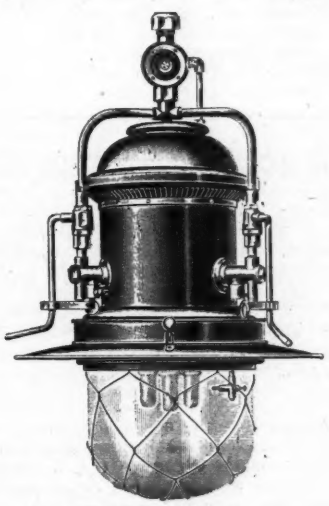
To those unfamiliar with suction plants, this volume will be extremely useful, though it should be supplemented by an observation of the actual performances of such plants. Mr. Philip Robson, in our issue of the 26th ult., contended that they are really a boon to the "town" gas industry. That may or may not be so. In either case, the more we know about such plants the better we shall be equipped for coming events. The young men of the industry in particular should procure this volume. Those who contemplate sitting for the Honours Grade of "Gas Supply" will notice from the syllabus that they must be conversant with town gas in competition for light, heat, and power; and so far as "suction" gas plants are concerned, this volume is a useful mentor on the subject.

GRAETZIN HIGH-PRESSURE INVERTED LAMPS,

AND A SMALL PRESSURE-RAISING PLANT.

KNOWLEDGE of the merits, from the points of view of economy and efficiency, of high-pressure gas lighting on the inverted system, is spreading among those who desire large sources of illumination either for street, shop, works, station, dock, or other situation where high-power lights are admissible. With this increasing knowledge comes increasing demand; and with demand, an extension of the sources from which it can be met. It is not therefore surprising that at the show-rooms of Messrs. J. & W. B. Smith, of 17-23, Farringdon Road, we should be introduced to a most compact plant for economically raising gas pressure, and to special high-pressure lamps of the Graetzin inverted type. The plant and samples of the lamps were being run for inspection; and both were justifying their reputed performances, working smoothly, and giving a steady light from the richly incandescent mantles—a light that appeals to visual judgment as being up to the ascribed power.

Dealing first with the high-pressure inverted Graetzin lamps, these are being made in four sizes; but the illuminating powers of the lamps have a greater range than is suggested by this bare statement—that is to say, the smallest size lamp (which is the one-burner pattern) has a head sufficiently large that (working at 50 inches pressure), by varying the gas-injector and thus the gas consumption, as well as the mantle, an illuminating power, from the single mantle, can be obtained of 500, 1000, or 1500 candles. There are also cluster mantle lights: A two-mantle one, with an estimated illuminating power of 1500 candles; a three-mantle one of 2300-candle power; and a three (larger sized) mantle one of 4500-candle power. The approximate lighting efficiency of the lamps equals 45 to 55 candles per cubic foot of gas, from which figures readers can make their own computations as to consumption for any desired total illumination that may be desired from any installation. The advantage of the cluster burnered lamps is that, at any hour of the night, the burners can be extinguished save one in each lamp, by the separate lever-cocks with which the lamps are fitted, or the whole of the burners can be extinguished by the mere act of stopping the compressor. The overall measurement of the lamps up to 1500-candle power is 2 ft. 9 in. by 17¼ in.; of the three-mantle ordinary lamp 3 ft. 1 in. by 23 in.; and of the three (large sized) mantle lamp 3 ft. 9 in. by 26 in.



The Graetzin Lamp.

It is an essential requirement that lamps that have to occupy situations such as these are intended to do, and to render such powerful illuminating service, should be strongly and well built; and, as our illustration shows, and inspection satisfies, this lamp is strongly constructed, and has organic features peculiar to itself. The casings of the lamps are made of strong enamelled steel; and in every detail it is apparent that long life is intended. Considering the great heat to which they are exposed, the burners are a part of these high-power lamps to which attention has to be seriously paid by makers. The burner and mixing chamber are in one piece; being constructed of cast-iron, and so practically imperishable, save as to the gauzes and steatite burner heads, which only require periodical renewal, and so is a matter of very small consideration. It may be mentioned here, and it is an important feature of the lamp, that the mantles are supplied in the soft or noncollodionized state, attached to a bayonet fitting collar, which connects up tightly to the burner nozzle. This form of attachment has its advantages when mantles require renewing. The outside fittings of the lamp show that utility has been the idea chiefly in mind in its design; and there is a commendable accessibility to all parts that are vital to the maintenance of efficient working. There is the gas adjustment for example. This can all be done from outside without taking the lamp to pieces. Each burner has its own external service; and, by the removal of a cap at the laterally projecting part (seen in the illustration) at the bottom

of the supply fittings to each burner, the person cleaning the lamp can, by a special key, at once withdraw each injector for cleaning. There is also a dust-trap at the bottom of each burner-service pipe, which can be cleaned out by simply removing a plug. The air adjustment to the burners is another interesting feature. The regulation is accomplished by means of a little flap or blade working on a spindle inside the air chamber. The flap is manipulated from the outside by a brass key; and when there has been proper adjustment for securing a perfect atmospheric flame, then a small set-screw will lock the regulator in position. The lighting of the lamps is also an important consideration. The range of method covers any possible requirement. But for street lighting, or where there is only intermittent use of the lamps during the hours of darkness, or where location renders this desirable, the firm recommend the use of the Graetzin distance lighter, which enables any number of lamps to be lighted or extinguished automatically by merely starting or stopping the compressor. The action is simple, but ingenious. When the compressor is started, the high pressure flashes the jet, the gas at the burners is ignited, and, the work of the jet being accomplished, the diaphragm valve in the distance-lighter comes into operation, and the bye-pass is entirely extinguished. The extinguishing of the lamp is accomplished automatically by cutting off the high-pressure gas, which reinstates the bye-pass, or by the turning of the separate control levers as far as they will go. The lamps are also fitted with a separate bye-pass service, so that, when the distance lighter is not installed, the bye-passing is carried out by connecting to the ordinary low-pressure service. Of course, the firm can readily vary the method of lighting and extinguishing; and further it will be understood that the application of the pressure-raising plant is not confined to the lamps here described, but may be introduced in connection with other suitable inverted or vertical burnered lamps.

The little belt-driven patent compressor that the firm are introducing can be operated by gas, steam, or electric power. The motive power most available is the preferable. In the show-rooms, the plant can be seen fitted to a 1-horse power electric motor or to a small gas-engine—of a size occupying no more space than the electric motor. It is a remarkably powerful plant for the size. It is very neat, and takes up quite a small amount of space. The plant inspected was equal to 500 cubic feet of gas an hour, working at 50 inches pressure. Other sizes are in course of production, both of smaller and larger capacities. From this, it will be gathered that the range of installation Messrs. Smith intend providing for is a wide one. No storage for the compressed gas is employed; and yet the lights in the show-rooms were seen running without the slightest oscillation. The pressure can be run up to 100 inches if required; so here again there is a large range of capacity, while the control of the pressure is entirely automatic—being regulated by the friction drive and a patent valve. When it is mentioned that the weight of the compressor is only 60 lbs., it will be appreciated that the space required for it, and the expense involved, have a correspondence in moderateness.

High-pressure gas, as is known, is of considerable use for industrial purposes and in the laundry. In the latter it is particularly economical and efficacious in the heating of machine rolls and

The Compressing Plant.

hand irons. With a compressing plant of this character, Messrs. Smith are branching out into this work. They are putting on to the market an economical hand iron and also a stove for heating ordinary irons. The gas consumption is low; and the efficiency good. These being the essentials for laundry work, where economy and rapidity of execution without loss of good result are desired, the new compressing plant should also find in this direction an excellent market.

POSITION OF MUNICIPAL WORKERS IN HOLLAND

By J. van Rossum du Chattel,

Engineer of the Amsterdam Municipal Gas-Works.

As some of your readers may desire to know a little more about the rules and regulations under which employees in municipal service in Holland are working, especially as the majority of the gas-works there are in the hands of the Municipalities (which is just the reverse of what is customary in Great Britain) I send the following particulars, which I trust may be of interest.

In Amsterdam, the following new regulations came into force on the 1st of July last. The workmen are divided in four classes: (A) Workmen permanently engaged. (B) Workmen taken on conditionally. (C) Odd workmen. (D) Young workmen of (say) fourteen to twenty years of age. Classes C and D are men and youths taken by the manager of the gas-works on trial. For an appointment in Class C, workmen should be from twenty to thirty-five years of age; and after two years' continuous service they are either discharged or pass into Class B. When a workman has been for one year, or at the utmost two years, in that class, he is removed into Class A; the appointment being made by authority of the town council on the recommendation of the manager. The men have to be examined medically in accordance with rules drawn up by the town council.

All workmen are divided into different groups according to the kind of daily work they have to get through. It is limited by time rosters; but it does not exceed 60 hours per week, as a rule. In special cases the working period may be increased to eleven hours per diem, without reckoning meal times; and the men are obliged to work at night or on Sundays if required. Overtime may be ordered in case of necessity to a maximum of eight hours a diem or twelve hours in a week; but when it arises from unforeseen circumstances, it is only to be imposed on the men who are willing to undertake it.

The minimum wages for unskilled labourers are equal to 19s. a week, and 20s. for married men or those who have completed two years' continuous service. The minimum wages for partially skilled labourers is 20s. weekly. Overtime is paid as follows: For the first two hours, 10 per cent. above the ordinary wages; for the two following hours, 25 per cent.; and for the other hours 50 per cent. Sunday work is paid 100 per cent. above 1-60th of the ordinary weekly wages. Workmen in Classes A, B, and D are allowed one week's holiday a year, with full pay.

If the service of a workman in Classes C and D has been for less than a week, he does not get anything if he is laid up through illness; but he gets full pay, during from one to thirteen weeks, according to the length of his continuous employment. It is given

Nature of Employment.	Limits of Wages.	Payments for Sickness.	Payments for Accidents.	Total Payments, Sickness and Accidents.	Total Payments for Wages.	Percentage of Payments for Sickness, &c., to Total Wages Paid.
	s. s.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
Mantle manufacturing girl	12 to 16	1 16 2·0	0 13 4·0	2 9 6·0	143 2 5·8	1·73
Guard	18 ,, 22	6 7 9·2	..	6 7 9·2	57 6 9·2	11·14
Watchman, labourer, cleaner	19 ,, 23	350 4 3·8	55 19 3·4	406 3 7·2	16,302 2 7·3	2·49
Assistant, fitter assistant, &c.	20 ,, 24	124 17 1·7	23 0 6·2	147 17 7·9	6,036 3 10·1	2·45
Lamp-fitter's assistant, borer, &c.	21 ,, 25	163 13 0·9	6 10 11·3	170 4 0·2	5,860 2 9·3	2·90
Driver discharging engine, &c.	22 ,, 26	64 13 9·9	12 4 2·4	76 18 0·3	2,792 17 0·9	2·75
Fitter, smith, &c.	23 ,, 27	245 8 11·1	48 19 6·2	294 8 5·3	8,678 0 7·4	3·39
Sorter, meter maker, &c.	24 ,, 28	96 16 7·8	1 14 9·6	98 11 5·4	3,046 18 2·2	3·24
Stoker, ascension-pipe cleaner	25 ,, 28	180 1 7·6	22 17 2·9	202 18 10·5	5,061 11 10·1	4·01
Press-fitter	25 ,, 29	4 11 0·0	..	4 11 0·0	222 12 9·9	2·04
Locomotive and engine driver	26 ,, 29	22 18 7·8	..	22 18 7·8	638 17 5 1	3·59
Foreman stoker, &c.	26 ,, 30	69 11 2·6	0 9 0·0	70 0 2·6	2,115 0 6·2	3·31
General workmen	12 ,, 30	1331 0 4·4	172 8 10·0	1503 9 2·4	50,954 16 11·5	2·97

for the former period after four to six weeks' service; for the latter period, after from eleven to twelve months' service. Workmen in Classes A and B get full pay during four weeks when they are laid up by illness, if they have been employed by the municipality fourteen weeks at the commencement of their illness, as is nearly always the case. If their service has been from fourteen weeks to a year, full pay is given, according to the scale applicable to men in Classes C and D. Should the service have been for more than 52 weeks, full pay may be given for a maximum of 39 weeks. In certain cases of illness, however, the mayor and aldermen can grant payments on more liberal terms.

When workmen in Classes C and D have received the maximum payment in case of illness, they are dismissed; but they may be taken on later. When a workman is ill, his wages are paid weekly on a declaration of the municipal doctor, who prescribes controlling measures; and the sick man forfeits his right to payment if he disobeys them. If the illness lasts longer than a week, the man is not permitted to go to his work again before the municipal doctor has declared that he is able to do so. A workman in either Class A or Class B who has partially recovered can be put on some light job on the same terms. Every case of illness and every accident has to be notified to an inspector. A workman who has been disabled by an accident, and wishes to get some indemnity for medical attendance, has to apply to one of the doctors employed by the State Insurance Bank.

In the special prescriptions drawn up for our municipal gas-works by the mayor and aldermen on June 2, 1908, there are a number of conditions which must be observed in each case of illness; and the medical man attached to this service is responsible for having them complied with. The payment to be made in case of accident, medical assistance, &c., is laid down in the Dutch Accidents Bill. The preceding table shows the different duties of workpeople, payments for sickness and accidents, total amounts of these payments, total wages paid, and percentage of the sickness and accident payments to the wages paid. All these figures relate to the first half of the year 1908.

The maximum payment for sickness in the first six months of last year to one workman was £25 15s. 0·3d. At the end of this period (July 1), the number of workmen in Class A was 1218, in Class B 3, and in Class C 447—making a total of 1668.

A workman in Class A is, on his application, allowed by the mayor and aldermen to leave the municipal service after a fortnight's notice. Workmen from Classes B, C, and D are discharged by the manager. A workman who stays away for three consecutive days without giving proper notice may be dismissed; and one who is discharged for unfitness receives a weekly payment equal to his ordinary wages during as many weeks as he has been years in the service. A workman who is 55 years of age receives when discharged a yearly allowance until a pension is awarded to him.

Having indicated the nature of the payments and allowances to workmen in the municipal service, I have now to deal with the punishments meted out to them for offences. The mayor and aldermen may inflict the following punishments on a workman in Class A: (1) Suspension during at least half-a-day, with loss of wages for this period; (2) reduction of wages for a certain time; (3) removal to a lower grade, for either an unlimited or a specified period, after which he may, on the first vacancy occurring, be reinstated in his former position; (4) discharge without any of the advantages above indicated with eventual forfeiture of pension. The causes for the infliction of punishment are: (1) Transgression of rules or disregard of the duties imposed on the workman; (2) judicial conviction for crime; (3) dishonesty; (4) deceit; (5) causing danger, injury, or damage; (6) insubordination; (7) embezzlement or corruption; (8) scandalous conduct or speech; (9) drunkenness while at work, or introducing intoxicating liquor into the works; (10) absence from work without permission, unless due to necessary and unavoidable causes; (11) inciting or inducing workmen to commit any of these offences.

If the manager of the gas-works is of opinion that a workman should be punished for one of the above-mentioned offences, he expresses it to the mayor and aldermen, who give the workman notice of the proposed punishment, and at the same time inform him that they will pass sentence unless he wishes to bring his case before the Court of Arbitration. If so, he has to notify this wish within three days. Should he decide to exercise this right, the mayor and aldermen immediately bring the fact before the Court, who hear the workman and the manager or his representative, witnesses, and, if necessary, other persons concerned in the case. The Court then decide whether or not the workman is guilty; and if he is, they say what punishment is to be inflicted on him. The mayor and aldermen notify to the workman within three days the sentence of the Court and the punishment they inflict, which has to be strictly within the limits of the sentence.

The Court of Arbitration above referred to is composed of five members and five substitutes. They hold office for three years, but are then eligible for re-election. The mayor and aldermen appoint two members and their substitutes; and the regular workmen elect a like number. These four members choose the fifth and his substitute. If they should find it impossible to make their selection in either the first or the second voting, the four members communicate the fact to the mayor and aldermen, and the nomination of the fifth member and his substitute is left with the town council. The members of the Court elect one of their number as President; the Secretary being appointed by the mayor and aldermen.

EXTRACTION OF CARBON BISULPHIDE FROM GAS BY WASHING.

The last number to hand of the "Journal für Gasbeleuchtung" contains an article by Dr. Ad. Samtleben, of Bernburg, on this subject, which has latterly been attracting a good deal of attention in Germany. The author remarks that since the annual reports of many German gas-works have lately contained reports to the effect that attempts to remove the sulphur which remains in gas in the form of carbon bisulphide have proved unsuccessful, it may be inferred that the problem has proved a knotty one for gas-works' chemists. This, he says, is indeed a fact. His succeeding remarks are epitomized in the following abstract translation of them.

Many attempts have been made, especially by English gas men, who were impelled thereto by statutory regulations, to extract from gas the sulphur which is combined with carbon; but they succeeded only in keeping the proportion below a certain minimum. Complete removal has not been achieved. Works which use German coal take no account of the sulphur in the gas; but where English coal exclusively is employed, attention is called for, because it cannot be denied that such coal contains much sulphur. It is, however, well known that of two coals containing different proportions of sulphur the one richest in this constituent does not necessarily yield the most sulphur on distillation, because the mode of combination of the elements has an influence on gasification. But this refers merely to the whole of the sulphur which is volatilized by the distillation process. The carbon bisulphide ordinarily occurs to a greater extent in gas the greater the amount of sulphur in the coal carbonized. Three investigations made with a Westphalian, a Durham, and a Yorkshire coal support this contention. The results were as follows:—

Description of Coal.	Westphalian "Consolida ion."	Durham "New Leversons."	Yorkshire "Silkstone."
Percentage of sulphur in coal.	0·75	1·30	1·64
Duration of trial, days .	10	8	8
Sulphur in gas, grains per 100 cubic feet—			
Average	16·9	34·8	39·4
Maximum	23·4	38·7	44·7
Minimum	9·6	31·0	31·6

It will be seen that the higher the proportion of sulphur in the coal, the greater is the amount of carbon bisulphide in the gas; and it is probable that this observation would be confirmed on wider investigation. Gas-works which use English coal have found it necessary to test the purified gas for sulphur, especially when a fresh description of such coal comes into working. The author, however, had occasion also to make laboratory trials of means of reducing the amount of sulphur in gas. The trials did not give any very positive result; but nevertheless they are worth reporting. They were not undertaken from hygienic considerations. The quantity of sulphur in the gas from good Durham coal scarcely exceeds 35 to 44 grains per 100 cubic feet; and the sulphurous acid resulting therefrom constitutes only a thousandth part of the total volume of products of combustion. With the constant exchange of air which takes place in a gas-lighted room, this has not the slightest effect. Our senses cease to detect sulphurous acid when it is diluted with 50 to 100 volumes of air, and such a high proportion would be unattainable in a dwelling room with even the smallest possible ventilation. The author has failed to detect a trace of the well-known pungent taste and smell of burnt sulphur in a closed room brilliantly lighted by gas from English coal. The desire to reduce the amount of sulphur in the gas arose solely from consideration of the possible harmful action of the products of combustion on heating and lighting apparatus.

That incidentally gas may be blamed for destroying other objects is shown by the fact that a little time ago in a cloth warehouse in the Bernburg district some bright material which had been stored for some years on a narrow shelf near the ceiling was taken down for stocktaking. It then appeared that the outer folds of the roll had been attacked and had lost their original colour. The owners had the attacked portions examined in a commercial laboratory, and it was found that they contained sulphuric acid, from which the rest of the material was quite free. The chemist could not trace the source of the sulphuric acid to anything but the town gas, with which the room was well lighted, while it was small and practically unventilated. It has also been reported that the book-bindings in the library of the Athenæum Club in London had been attacked by sulphuric acid; but it has not been proved in this case whether the acid was derived from the gas.

It appears from the investigations of Witzeck and others that the sulphur in town gas is chiefly in the form of carbon bisulphide. English gas-works have applied lime purification for reducing its amount. The lime depends for its action on its conversion to calcium oxysulphohydrate, which is capable of absorbing carbon bisulphide with formation of calcium sulphocarbonate. Lime purification is objectionable on account of its tediousness

and offensive smells. A great part of the sulphur in coal gas can be got rid of by subjecting the gas to high temperatures; but the necessary heating presents great difficulties on the large scale, and entails considerable expense. The remaining alternative for the elimination of the sulphur is by a washing process, the idea of which is not new, since it occurs in an English patent, No. 699 of 1862.

For the laboratory experiments on washing processes, a vertical glass condensing cylinder, 20 inches high and 2½ inches in internal diameter, having a capacity of about 2 litres, was filled with short pieces of glass tubing, which, on account of their large surface, ensured effective washing. A drop funnel was fixed in the top of the cylinder, and the washing liquid was run gradually in through it. After traversing the cylinder, it was syphoned off from the chamber at the base of the cylinder. For each washing test 180 to 200 grammes of liquid were used. The gas was passed through the cylinder in an upward direction, and on leaving it was passed through a small purifier containing oxide of iron for the removal of any sulphuretted hydrogen formed by the washing process. In an hour, 100 litres (3·53 cubic feet) of gas were passed through the apparatus, and simultaneous determinations were made of the sulphur in the washed gas and in gas which had not been washed. The gas was taken from the outlet main to the district, and the sulphur determinations were made with Drehschmidt's apparatus [which is very similar to the Gas Referees' apparatus]. The first washing liquid tried was that proposed by Pippig and Trachmann. According to their process, the gas, after drying, is treated with an alcoholic solution of aniline containing a trace of sulphur. The action is shown by the following equation:—

$$CS_2 + 2C_6H_5NH_2 = CS(NHC_6H_5)_2 + H_2S.$$

It will be seen that sulphuretted hydrogen and sulphocarbanilide, which is a body only slightly soluble in liquid, are formed. The method has been experimentally tried on many occasions, but has not fulfilled expectations. The first trial was made with a mixture of 87·5 parts of alcohol, 12 parts of aniline, and 0·5 part of sulphur. On washing the ordinary undried gas with this liquid, the mean result of three trials was as follows:—

Untreated gas, 34·2 grains of sulphur per 100 cubic feet
Washed gas, 25·5 " " " " " " "

Thus only 25·6 per cent. of the sulphur was removed by the washing. Moreover, the use of alcohol as a diluent for aniline would preclude the application of this process in practice, because the alcohol would be freely taken up by the gas on account of its low vapour tension and lost. For this and other reasons, Frank has proposed to use a mixture consisting of particular proportions of anthracene oil, heavy benzol, and high-boiling tar bases, containing 5 per cent. of aniline and 0·2 per cent. of sulphur. In order to try this modification, a mixture was made of 50 parts of anthracene oil, 35 parts of tar bases, 10 parts of heavy benzol, 5 parts of aniline and 0·25 part of sulphur. The results of a large number of trials, of washing with this liquid a gas containing from 31·3 to 39·5 grains of sulphur per 100 cubic feet show that from 19·3 to 31·2 per cent. of the sulphur was washed out. The result therefore was not much better than that obtained with the alcoholic solution of aniline; but it may be that the precise mixture which Frank intended to use was not employed, as the results are not so favourable as figures reported by him.

It appeared that the chief constituent of the tar bases—viz., chinolin—might have absorbed the bulk of the carbon bisulphide; and it was decided to try chinolin as a solvent for the aniline. Chinolin boils at 240° C., and is therefore much less volatile than alcohol. On using a solution of 5 per cent. of aniline in chinolin with a small quantity of sulphur on a gas containing from 41·9 to 44·4 grains of sulphur per 100 cubic feet, it was found that from 46·6 to 54·3 per cent. of the sulphur in the gas was extracted. The efficiency of this liquid was therefore considerably higher than that of the tar oil mixture. Unfortunately, it appeared from the trials that the absorptive power of the washing liquid gradually decreased; so that after 280 cubic feet of gas had been passed through, the liquid only extracted 30 per cent. of the sulphur from the gas.

A second patented process is that of the Rositz Sugar Refinery, in which an oily liquid produced by the distillation of molasses residues is used for washing carbon bisulphide from the gas. This liquid is a complex mixture of various organic compounds. The patentees, however, were unwilling to provide a sample of the oil in question. It seems, however, that, as the amines of the fatty series result from the distillation of molasses residues, these amines might combine with the sulphur in the gas. Thus, for instance, according to Blennard, the tertiary trimethylamine combines with carbon bisulphide and forms an additive product, which is a solid body melting at 125° C. It has the formula $N(CH_3)_3(CS_2)$. Trimethylamine is found in commerce in the form of a 33 per cent. aqueous solution. This was tried as a washing liquid, and the mean result of a number of trials showed that when the gas contained 35·9 grains of sulphur per 100 cubic feet, 15 per cent. only of the sulphur was removed by the washing. This result was, of course, disappointing. It appeared that the carbon bisulphide, as soon as it was combined with the vapour of the trimethylamine, was again taken up by the excess of the latter and escaped with it. Equally negative results were obtained with the use of the tertiary amines of the aromatic series. Of this group, dimethylaniline, having a boiling point of 192° C., and diethylaniline, having a boiling point of 213·5° C., were tried. Both liquids at first took up carbon bisulphide, but soon became saturated; proving no more suitable than trimethylamine for the purpose in question.

The comparative failure of these trials gave the impression that the washing agent must be one which combines very readily with carbon bisulphide. Consequently, phenylhydrazine suggested itself. If carbon bisulphide is brought into contact with this substance in the liquid state, it combines with it energetically to form phenylhydrazine phenylsulphocarbazinate $CS(SN_2H_2C_6H_5)N_2H_4C_6H_5$. The reaction in question is used for the detection of carbon bisulphide in commercial benzol. It was impossible to use pure phenylhydrazine for washing out sulphur, because its melting point is 23°C. It was therefore mixed with chinolin in varying proportions, with a view to finding what proportion constituted the most active mixture. The results were as follows: A 10 per cent. solution of phenylhydrazine in chinolin reduced the sulphur, amounting to from 34·4 to 36·4 grains per 100 cubic feet of gas, by, on the average, 53·9 per cent. A 20 per cent. solution, applied to gas containing from 36·2 to 40·4 grains per 100 cubic feet, reduced it on the average by 60 per cent. A 40 per cent. solution applied to gas containing from 28·8 to 41·9 grains per 100 cubic feet reduced the sulphur on the average by 74·1 per cent. Finally, a 75 per cent. solution was applied to gas containing from 41·9 to 46·6 grains per 100 cubic feet, and 81·7 per cent. of the sulphur was removed thereby. It thus appears, as was to be expected, that the activity of the washing liquid increased as the proportion of phenylhydrazine in it was increased. The 40 per cent. solution could be considered, however, to have given a satisfactory result; and it seemed desirable to institute with it exhaustive trials on a working scale. It appeared, however, somewhat doubtful whether chinolin fulfilled the requisite conditions for a diluent for the washing process. Such a diluent should have a high boiling point and a very low vapour tension at ordinary temperatures; so that the amount taken up by the gas would be practically negligible. The boiling point of chinolin is, from this point of view, none too high. It therefore seemed desirable to make an addition to the solution of a high-boiling and non-volatile anthracene oil such as has been applied for some years for the extraction of naphthalene from gas.

A further trial was therefore made with a mixture of three parts of anthracene oil and one part of the 75 per cent. solution of phenylhydrazine. Of this mixture, 180 grammes were used in the apparatus already described; and in order to test the life of the phenylhydrazine, the experiment was prolonged until 20 cubic metres (about 700 cubic feet) of the gas had been washed. Sulphur determinations were made after successive portions of 4 cubic metres (about 140 cubic feet) had passed through the apparatus. The result showed that with gas containing on the average 37·9 grains of sulphur per 100 cubic feet, 54 per cent. of the sulphur was extracted until 12 cubic metres (about 420 cubic feet) of gas had passed through. After the passage of this quantity, the proportion of sulphur extracted fell off very rapidly; so that the limit of the practical absorptive capacity of the solution had evidently been reached at that stage. It therefore appears by a simple calculation that 6·67 grammes of carbon bisulphide were absorbed; and thence it may be calculated that, since theoretically one part by weight of carbon bisulphide should combine with three times its quantity of phenylhydrazine, 60 per cent. of the phenylhydrazine in the washing liquid was utilized in the absorption. Calculation further shows that 1 lb. of the washing liquid has reduced the sulphur in 1065 cubic feet of gas by 54 per cent. In order to make the washing solution fit for further use after this quantity of gas has passed through it, it would be necessary to add fresh phenylhydrazine. The addition could be repeated until it became necessary to filter off the product of the reaction, which settles out as a sludge. This calculation is, of course, based only on the laboratory experiment; and it would be a mistake to conclude forthwith that the method would be practicable on a working scale. Generally, laboratory results are better than those obtained in practice. It might be, however, that the vigorous washing action of a rotatory washer-scrubber would afford better results. To determine this, trials on a working scale must be undertaken; and the author has not seen his way to carrying out such trials. Even if they proved successful, an important question would arise: Is the cost entailed by the new process of purification justified by the advantage gained?

Both chinolin and phenylhydrazine are products of chemical works on a large scale; but their price is high. Even if a large demand for them effected a considerable reduction in cost, their use for extracting sulphur would nevertheless greatly increase the charges under the item "gas purification." The advantage to be gained appears to the author to be quite small, as the presence of carbon bisulphide in coal gas has not been found to be of serious moment. Even should other processes for the extraction of sulphur from gas be introduced, they can scarcely have any practical importance. Moreover, the case for the extraction of carbon bisulphide is considerably weakened by the fact that the proportion of carbon bisulphide in gas made in vertical retorts is less by about 40 per cent. than that in the gas from horizontal retorts. Consequently, it appears superfluous to consider the question further in regard to the gas which will be made in the future.

At the meeting of the Institution of Civil Engineers on the 2nd inst., Mr. A. Bruce Radford, of the Water Engineer's office, Liverpool, was elected an associate member.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Works of the Lea Bridge District Gas Company.

On Saturday afternoon, the members of the Association visited the works of the Lea Bridge Gas Company. They were met at the entrance by Mr. F. W. Cross, the Engineer of the Company, and his Assistants, Mr. D. W. Winslow, Mr. S. Wilkins, and Mr. D. C. Cross, who personally conducted them round the works.

It will be remembered that Mr. Cross kindly arranged the visit at short notice, to take the place of an inspection (which it had been found necessary to abandon, temporarily at any rate) of the Woolwich Arsenal high-pressure gas installations; and though, as was pointed out, there was nothing to be seen of a very special character, the members found plenty to interest and instruct them. It is barely three years since the Senior Association for the Southern District (during Mr. Cross's presidency) visited Lea Bridge; and in the interval not much change has been made in the works. In one important respect, however, connected with the Company's operations, there has been a great alteration—and that is in the output of gas. In 1905, the make was 258 million cubic feet; whereas at the present time it may be roughly stated at 330 million feet. The district covered by the Company—Walthamstow and a part of Leyton—is one that has rapidly developed; and there is still plenty of room for further building, and consequent growth of population. Though just at present new houses are being put up at a somewhat slow rate, it is possible to regard the future in this respect with a considerable degree of equanimity, for there is no doubt whatever that in course of time accommodation will be provided for a much larger number of residents.

With reference to this building question, Mr. Cross pointed to a number of divided houses, or flats, which have been put up, close to the gas-works, on the Warner Estate, which is beginning to be developed. There are no less than 700 of these flats; and the desirability of securing the tenants as customers of the Gas Company naturally struck Mr. Cross very forcibly. He therefore determined upon making an experiment. An arrangement was come to with the owners, under which they pay a small sum for the carcassing of the flats and the fitting-up of each one with a slot installation, including a cooker and everything else. This is done before the tenants come in; and, once fixed, the meter is not removed when a flat is vacated. Each is provided with a locking cock; and on the back of the meter-card there is found an intimation that the cash has been collected from the meter, and the supply of gas locked off, together with the information that, upon application being made to the Company, an inspector will be sent to turn on the gas. Attached is a printed card, addressed to the Company, and requesting the attendance of an inspector for the purpose named; and all the would-be consumer has to do is to sign the card, fill in his address, and post it. Upon a tenant giving notice to the Warner's Estate Company of his intention to remove, an intimation to this effect is sent to the Gas Company, who are thereby enabled to collect the cash before the tenant leaves the premises. An arrangement of this kind must, it would seem, be an advantage to the Gas Company; and that the owners of the estate regard it as an advantage from their own point of view would appear equally certain, inasmuch as they advertise the flats as being to let at 7s. per week, "with free removals, free fire insurance, and slot-gas installations already laid on." Altogether, of course, the neighbourhood is one that lends itself peculiarly to the development of the prepayment system of supply; and therefore it is not to be wondered at that this part of the business is going strong. Started in 1901, there are now well over 6000 slot consumers, which is rather more than half the total number of the Company's customers. A point to be noted is that, particularly owing to the number of removals and consequent cut-offs that take place in the district, the card-index system is found to be a most convenient one for application to the prepayment branch of the business. It may also be of interest to mention that the whole of the slot-meters are for use with a shilling. At a meeting of the Midland Association held in 1895, Mr. Cross professed his faith in the shilling meter; and the results at Lea Bridge have fully justified his faith.

The Lea Bridge Company are not at all peculiar in that they find a keen competitor in municipal electricity. In fact, as there are two Local Authorities in their district—Walthamstow and Leyton—so there are two publicly owned electrical undertakings. In Leyton, all the street lighting is done by electricity; but in Walthamstow there are still about 1000 gas-lamps, which compete with arc lights in the main thoroughfares and with carbon filament lamps elsewhere. In the circumstances, of course, gas should find no difficulty in demonstrating its great superiority; but in the district now referred to it is perhaps brought a little nearer to electricity by the fact that the Council limit the consumption of gas to 3 cubic feet per hour, with upright incandescent burners, and get over the difficulty that is thus created, of filling the mantle, by shortening the fork and cutting the mantle down, so that it—or rather what is left of it—may become thoroughly incandescent. The result of this may possibly be to "save the face" of the electric lights; but it does not seem to be the best policy in the interests of wayfarers by night. The price of gas, it may be mentioned, is 3s. 4d. per 1000 cubic feet; but exactly what is charged for the public electric lighting would appear difficult to get at, as the tramway and the lighting accounts are rather intermingled.

Now to come to the works proper, the carbonizing is carried out in inclined retorts—a system in which the passing of time has done nothing to shake Mr. Cross's faith. The installation, which consists of eight beds of eights, 22 in. by 15 in. and 20 feet long, has been in operation for over nine years; and no trouble at all is experienced. Working eight-hour charges of from 8 to 8½ cwt., the average make is nearly 12,000 cubic feet per ton; the coal used being a mixture of Durham and Yorkshire. To the proper mixture of the coal, Mr. Cross devotes the utmost care; for he realizes that this is where he gets his results. Retort-house governors are in use, and are found to be a valuable adjunct to the carbonizing plant. There is also still on the works an old house of horizontals, which, however, is only used in cases of emergency, and is not working now, though during a portion of the winter a bench has been for a few weeks kept heated up as a stand-by, in order to obviate an additional big bench of inclines being put on.

The works are provided with a siding from the Great Eastern Railway; and on arrival the coal is tipped from the trucks by means of a hydraulic ram, and passes through a screen to the elevator-pit, from which it is raised by a bucket conveyor on to a band conveyor, and ultimately deposited in the store which runs completely along one side of the retort-house. From the store, the coal is raised (in trucks holding 10 cwt.) on an hydraulic lift to a floor 40 feet high, above the charging hoppers. Here the trucks are run on rails to the exact hopper in which the coal is required. The method of raising the coal by hydraulic lift in trucks, though usual enough in connection with carburetted water gas plants, was undoubtedly a novelty to many of the members in connection with a coal-gas retort-house. The system has, however, proved eminently satisfactory at Lea Bridge; for there has never been an hour's delay in the working of it since it was started in 1899. After the coke leaves the retorts, it falls to the floor beneath, where it is quenched, and then wheeled out to the yard. To facilitate the disposal of his coke, Mr. Cross intends to adopt the system now in vogue at Tottenham and Kensal Green—as recently referred to in the "JOURNAL"—as well as on the Continent, of selling it in small bags of (say) 28 lbs.

The Lea Bridge District Gas Company was one of the very early gas undertakings to adopt carburetted water gas; and Mr. Cross is a firm believer in it on account of its all-round advantages. There are two of Messrs. Humphreys and Glasgow's sets which were originally of a capacity of 300,000 cubic feet per day each. About five years ago, however, the size of the generators was increased so as to give them a capacity of 550,000 cubic feet each per day. In connection with this plant, the members were interested in the working of Dr. Colman's cyclone tar-extractor. There is separate plant for the coal gas and the water gas right up to the inlet to the gasholder; and as the Company are still under the sulphur clauses, both lime and oxide of iron are used for purification.

There are excellent show-rooms situated in the centre of the district, which are also used as a depôt for the fitters and service-layers; and that the Company have great faith in their own future is instanced by the fact that they have lately acquired additional ground in order that there may be plenty of room available for carrying out extensions as required.

After the inspection, the members adjourned to the Stores Department, which had been fitted up as a tea-room, and there they were entertained at tea.

Mr. CROSS subsequently gave a description of the works, and stated he was glad to see the members of the Association once again. It was some eight years since they had visited the Lea Bridge works; and during that time the Association had considerably grown, and the Company likewise. He trusted they would pay another visit after perhaps another similar period had elapsed, when they had grown stronger still. The growth of the undertaking had been remarkable. He entered the service of the Company in 1896; and he found that for the year ending 1895 the annual output was 90 millions. At the end of 1908, it was 331 millions, which was a remarkable increase. The large estate of self-contained flats of the artizan class known as Warner's Estate had considerably helped in this. Each house had been piped by the Company, who left an addressed post-card stating that on receipt of it they would come and turn the gas on. The whole of these post-cards came in. They had also, in open competition with the Electric Lighting Committee, just secured the contract for a large mission church with institute, hall, library, and rooms attached; and they were about to spend £100 on the fittings. There was plenty of virgin ground in their area, which was being gradually built on.

The PRESIDENT (Mr. W. J. Liberty) thanked Mr. Cross for his kindness in giving them so interesting a statement, after having taken them over the works. It was with very much pleasure that they found themselves at one of these go-a-head suburban works, which had risen in output from 90 to 331 millions in thirteen years. It put them in mind of the neighbouring Company, the Ilford Company, similarly placed, with an output of 362 millions, whose rise had been equally rapid. So it seemed to be with all companies on the outer ring of the Metropolis. The exodus from the centre of London, which had somewhat slackened, had now, owing to the increasing facilities for travelling and the desire of people to occupy more modern houses, set in again more rapidly

than ever. Those present who were connected with the great urban companies knew how increasingly difficult it was for them, in spite of modern improvements in working and new business methods, to get any increase on the output or retain their present figures; and yet all knew that they were working with the most up-to-date appliances, and the greatest energy was being displayed by all concerned. But against this was the continual rush of the population over the border, which left thousands of houses every year untenanted. When conversing with a friend only a short time since about the anticipated visit to the Lea Bridge works, he was told: "You may not see much in the way of modern appliances; but they know how to make gas." After the visit that day, they could add, "And how to sell it." He noticed as they went round that day one or two good features. There was the cyclone tar-separator, and there were the experiments in connection with the hydraulic main and the carrying of the foul main outside so as to make it more easily get-at-able. With regard to the much advertised Warner Estate, he had long wanted to see this. From a gas point of view, he congratulated Mr. Cross on having piped no less than 700 flats on the estate, and carried the fittings to three points and a cooker, at a fair price to the Company. The truth of the matter was that new tenants would not take the flats unless they could be first assured that the gas cooker and lights were ready for them when they went in. He had heard, and believed it was true, though he was open to correction, that on this very estate there was a block of tenements that the owner had not had gas put into, with the result that he could not get families to stay in them, and the blocks remained empty. They were deeply indebted to Mr. Cross for his kindness, and also to his Assistants, Mr. Winslow, Mr. Wilkin, and Mr. Cross, jun.

The Senior Vice-President (Mr. W. A. Barnett) moved that the heartiest thanks of the Association be tendered to Mr. Cross for his goodness in having them at Lea Bridge that afternoon. He had been particularly interested in going round the works, and called to mind the visit that was paid by the Association some years since, as referred to by Mr. Cross. He noticed the great advance the Company had made. It was impossible for the members to have been at the works that day without adding to their store of knowledge. With reference to the President's remarks about the migration that was going on from the centre of the Metropolis, he believed it was a fact that some 16,000 families left the area of the Metropolis annually.

Mr. F. Ainsworth seconded the vote, and dwelt on the "unfair," as it seemed to him, competition that existed in the neighbourhood, and that of Ilford, between the gas companies and corporations owning electric lighting works, and yet in spite of which the gas companies were not only holding their own, but were going ahead by leaps and bounds.

The vote having been carried by acclamation,

Mr. Cross, in response, said, with reference to Mr. Liberty's remarks about the block of flats that had not been fitted for gas, it was a fact that, being unable to come to an equitable arrangement with the owners of the Warner Estate in the beginning, he had refused to lay a gas-main down one of the roads, with the result that one of the blocks in that area being without gas was always empty. People would not remain. Therefore the Manager of the Estate came to him, and asked to have the main laid, and he had agreed to do so. They were rather handicapped in the matter of capital charges; but with their increasing output, they hoped soon to get over this. He might remark that one of the hardest worked men in connection with the works, especially on the district, was Mr. Winslow, one of the members of the Association, to whom the chief results of the outdoor work were attributable. He should like Mr. Winslow to say a word.

Mr. Winslow said it was very good of Mr. Cross to say such kind things of him. It was solely due to Mr. Cross's efforts, in the case of the church and institute lighting, that their Company had obtained the contract against the Corporation's Electricity Department. It had been a very hard fight; but Mr. Cross had pulled through.

VICTORIAN GAS ASSOCIATION.

Questions Discussed at the Third Annual Meeting.

(*Concluded from p.* 382.)

III.

"What is the best material and method for caulking leaking joints in the plates on the crown of a gasholder while in action?"

Mr. R. Bearup said he had had some experience in Hamilton in connection with the subject of the question. After the gasholder had been in use for 25 years, the crown sheets showed very small open holes—not only at the joints, but on the plates themselves. After a thunderstorm, if he went to the holder he could see the gas bubbling through the holes. It became so bad at last that he put the holder out of action, and obtained a price for renewing the top. Electric light competition started soon afterwards, and his Directors then decided not to put in a new crown. He considered it a pity that so much gas should go to waste; so he endeavoured to stop it. He first tried tar, which he put on in two coats. While the tar was hot, he sprinkled cement upon it, and rubbed it well in with a brush; but the mixture did not get into the proper spots. At the end of the first year, he found the holder was getting into much the same condition; so the following year he let it down altogether. Then when it had no pressure in it, and on a very hot day, he repeated the process; the tar being very hot, and the cement dusted on two sheets at a time. There being no pressure from the inside, the mixture got well into the holes of the holder, and it turned out such a success that the same holder, with the crown treated as he had described, was in use at that day—six years after treatment. The method he had adopted was not original, as something of the same sort was described in either Mr. Newbigging's or Mr. O'Connor's "Handbook."

Mr. J. A. Ambrose (Heidelberg) said he had had a similar experience with a holder. He took about a bucket of tar, and put in 1 lb. of slaked lime. With the mixture he tarred over the whole surface of the holder; afterwards dusting it with bluestone dust. This was done about three years ago; and the holder was quite tight now.

Mr. D. Warren said that many years ago, when he was a boy at Portsea, he, like other innocent men in charge of gas machinery, had trouble of the same sort. He thought tar was the most awful thing one could put on a holder. They would find that it was leaky, and the gas penetrated up to the top and condensed into moisture, thus causing oxidation. In his younger days, the Dutch tried tar, and it was a failure. He tried it at Geelong in the sixties, and gave it up as bad, excepting where the bottom plates of the holder were entirely under water. He had found oxide paint durable in every sense. In cases of leakage of the joints, he had had very little trouble using it. One of the men would go up, scrape the joint, and caulk it. The works at Footscray had been in his hands for 31 years, and he had never found leakage in the holder that he could not deal with. Once a year he gave his holders a coat of paint. A man first went over the holder with a scraper, and afterwards it was painted; and it was then good for another year. The paint cost pounds where the tar cost shillings; but, in his opinion, the paint was the cheaper of the two materials to use.

Mr. W. Perkins said when he first went to Horsham the holder was leaking badly, mostly at the joints. He first scraped, cleaned, and painted it, and then took a brush and some paint and worked it well into the joints. Then he put on a mixture of red lead and putty in the same places. When it was thoroughly dried, he put on more red lead. The holder was now painted with oxide paint on the top, and for the first two plates down. Then it was tarred. It was three years since he had put it right, and it had been going satisfactorily ever since. The tar stood very well.

Mr. J. Lord remarked that he had two holders which had been tarred on the sides for at least thirty years; and he had never seen a sign of leaking.

The President said they were in the habit of using tar at Ballarat; but in conjunction with it they put a certain amount of either Neuchatel or Trinidad bitumen. He did not believe a paint had ever been made that was equal to it; it would last longer than any paint. He could show the members holders that had not been scraped for twenty years; and if they could show him anything better, he would be pleased to see it. So far as caulking the tops of the holders was concerned, he remembered at one time they had a crown that had been very badly put together. They had to caulk-in strips of lead, and then they were troubled with very small leaks between some of the angle-irons and the plates. He found that by making a specially good mixture of bitumen and boiled tar, thinned-down with benzene, these were very effectively dealt with. The mixture would stop any small leaks if two or three coats were put on. In a kerosene tin of tar could be put from 8 lbs. to 10 lbs. of bitumen. They must boil the tar first, and then drop in the bitumen, afterwards thinning it down with benzol. It was absolutely essential in the painting that the mixture should be put on thinly, as there would then be no blisters. He could show the members some holders that had been in use for nearly half-a-century, and to his own knowledge the tar had not been scraped off them for twenty years. When the holders were first put up, they cleaned the crown plates with caustic potash, so that the crowns shone like a new shilling. As a priming paint, they used red lead and raw oil. In painting the holders, he had always used raw oil, because the virtue was practically taken out of it when it was boiled.

Mr. W. Ray said the difficulty he always had was that when the plates went wrong, if they lapped over, it was hard for pitch to run uphill. If the holders were built against the weather-board principle, it would be easier to manage with them. One of the greatest difficulties attending the use of tar was that there was a lot of acid in it. If they got the acid out by precipitating with lime, they had a really good thing. He had painted a holder that dipped into the water, using the top lift more than anything, and had become so tired of painting it that he had resorted to tar. Speaking of red lead, he came on the original coating of some plates which he had used for years, and found it as prime as when it was first put on.

Mr. T. Lord said in his opinion the best preservative for the iron in gasholders was red lead and oil.

The President said he should like to know whether any of the members were in the habit of using pyrites paint, as it was employed in various parts of Victoria.

Mr. Ray said he had been using six or seven descriptions of paint—recently some from America. It was a kind of metallic paint, which was doing very well on some of their holders. It was a first-class paint.

IV.

"What is the cause of a crystalline deposit in the gas-main leading from the condensers to the purifiers, and how can it be effectively removed?"

Mr. J. A. AMBROSE said in the first place he attributed the deposit to high heats. The gas came direct from the head of the main, and entered the condenser so hot that the hand could not be put on the pipe. He found the best means of getting rid of the deposit was to insert a steam-pipe in the second condenser, and let it run for ten minutes; then the stuff would come out. The formation of the deposit seemed to depend on the class of coal they were using. With Newcastle coal he had to clean out the main once a week; but with Maitland coal he could run for six months. There seemed to be more shale in the latter. At North Shore (Sydney), by making the inlet the outlet, they were very successful in dealing with this deposit.

Mr. R. O. THOMPSON asked Mr. Ambrose if the trouble was greater since he had used the steam-jet exhauster.

Mr. AMBROSE replied that since he had used it he had not had any trouble; and his make of gas had increased fully 50 per cent. He had two condensers, and it was the second that became choked. It was so bad about eighteen months ago that the deposit got into the centre-valve, and one night at half-past six he was burning oil in his house.

Mr. D. WARREN said he had not had any trouble from crystals for three years. The only place he had seen them had been on the top layer of a dirty purifier. He had four condensers. For an exhauster he had never wished to have anything better than a steam-jet. When the Metropolitan Gas Company had hundreds of men in the streets carting loads of crystals taken out of the pipes, he had none at Footscray. They could not have a better record than this.

Mr. W. RAY said he should like to know what was Mr. Ambrose's make of gas. If he would give them this, and also the size and length of his pipe, they could work the matter out. It was not so much a question of how to get rid of the obstruction as how to avoid having it there. He was a great believer in slow travelling. Time was an important factor in gas making and purification. He, like everyone else, had had stoppages through the crystals; but his remedy was big pipes, big area, and slow travelling—4 feet per second. If they followed this line of action, they would not have much trouble with blocked-up pipes. In slow travelling, it was necessary to have a reasonable length of main from the pipes to the condensers. He remembered a few years ago having a stoppage through carbonate of ammonia. They talked about naphthalene, but they could blow this away; whereas if they got carbonate of ammonia into their pipes they would have to dig it out with a bar. It was no use talking unless they could do something to prevent these things. If Mr. Ambrose had a remedy, was it a permanent success? Because if the trouble recurred, his remedy was no good at all.

Mr. AMBROSE said they made 10,000 cubic feet of gas per day, and had gone up to 34,000 feet—his maximum make being from 1500 to 1600 cubic feet per hour. His connections were 6 inches in diameter.

Mr. RAY said if this was anything like at the rate of 4 feet per second, it was evidently due to being caught in the exhauster.

Mr. HOLMES HUNT remarked that Mr. Ambrose had said that after using different coal he had never had any trouble.

Mr. RAY: It all comes back to the coal.

Mr. J. LORD said he had a steam-jet in use on the end of the hydraulic main, and he thought he would put it behind the condensers. When he placed it there, he found that the second one was choked up; so he shifted it behind everything excepting the purifier, and worked the cooler, and took the steam out of the gas before it entered the purifier. He had never seen naphthalene since.

Mr. HOLMES HUNT said he took it that the gentleman who put the question could now sum up the cause of his trouble as either improper or insufficient condensation. Gas would carry naphthalene up to saturation-point according to its temperature. When they got below this temperature, the naphthalene was bound to precipitate. If the author of the question wanted to remedy his stoppage effectively, he (Mr. Hunt) thought he should tap the main, and run in some kerosene or benzene, and so get it out of the way, pending an alteration or modification of the condensing plant.

Mr. D. WARREN remarked that Mr. Ambrose had two condensers, and one became exceedingly hot; but he could obviate this very easily by running a coil of soft rope round it. His first condenser would get comfortably cool, and his second one be cold. A spray of mineral oil would clear that.

Mr. J. B. EARL said he was greatly troubled at Lilydale with crystalline deposit. Having asked the cause, he was informed that he was getting too high heats; but he did not think this was so. He had a 6-inch main running from the hydraulic; and horizontal condensers comprised of eleven 9-feet lengths of 6-inch pipe. He found the changing-valve of the purifiers was covered three-quarters of the way. Mr. Bearup had told him he thought kerosene might clear it. Eventually he took out some of the crystalline deposit, and put some kerosene to one and some hot water to the other, letting it remain for some time. He found the kerosene did not make an appreciable difference; but the hot water seemed to dissolve the deposit. At the earliest opportunity he poured in a quantity of boiling water, and the pressure was relieved. Concurrently with this, he had a change of coal. That which he had been using was Newcastle, but the fresh coal was Maitland; and he had not had any trouble since.

V.

"What is the best method of tracing and reducing the amount of gas not accounted for; and what is a reasonable percentage of same?"

Mr. J. LORD said he had not had a great deal of experience in leakage. They had at Williamstown a good many roads where the grass grew along the sides; and, if there was a leakage of gas the grass changed colour, and he soon found it. This was a very good thing to go by. In cases where there was no grass, he watched for blow-flies. Another method he had was to drive a pick into the ground as near as he could get to where he thought the leak was; and if it was within 8 or 10 feet, he could detect the gas escaping. Last year his unaccounted-for gas was about 10 per cent.—the gas made for the half year being about 13 million cubic feet, and their length of mains something like 35 miles.

Mr. W. PERKINS said that since he had been at Horsham he had had his mains leaking very badly. The system he adopted was to make a hole 3 feet square down to the main, and bore three holes into the main. In the centre hole he put a bladder; and connected the other holes with a stand-pipe to a gauge attached to a Croll meter. At a distance of 10 chains he put in another bladder. After he was certain that the bladders were tight, he would turn on the gas, and run it for a quarter-of-an-hour without taking any notice. Then he would run it for another quarter and check it. Afterwards he would shift the farther bladder a chain nearer, to see if the leakage had been reduced; and he would gradually bring it closer until he localized the leak. If it were a main that was leaking, he would strip it for the purpose of stopping it. He had been able to locate a good many leaks in the way he had explained. His mains were 6-inch for a portion of the way, and then branched off into 4-inch. When he went to Horsham, the Company were selling 5600 cubic feet of gas per ton of coal; but during the last six months they had sold 9000 cubic feet.

The PRESIDENT asked the speaker what was the leakage before he started.

Mr. PERKINS said there was not any station meter to show the quantity of gas made per ton of coal; but the sales were about 5600 cubic feet per ton, whereas now they were 9000 to 9200 cubic feet. There were a number of asphalt footpaths in Horsham, and they had often to bore through them to get at the mains. He inserted a 2-inch tube, and through it put in the service-pipe. They were laid shallow. The greatest trouble they had with their services seemed to be in the gutters. He was trying, by wrapping the end of the 2-inch pipe with tarred bandages and covering them with sand, to stop leakages.

Mr. T. GALE said his method of putting in services was to force the pipes through and under the asphalt. He did not bore; for Footscray was a very stony place. When crossing channels he used a telescope—a larger pipe to carry one inside. They used ½-inch service-pipes ordinarily, and ¾-inch pipes for shops. They did not telescope cast-iron pipes.

Mr. J. BOWMAN said the system they always adopted at Sale with reference to unaccounted-for gas was a simple one. They bored over the main with an auger at intervals of 4 ft. 6 in. The man who did the work was good at detecting leaks, and he could do a good deal in a day. If he found any leaks, he marked them, and then they were attended to. They did the same with service-pipes. As soon as the boring was completed, they sent a gang of men to patch or take up defective mains. This work was done thoroughly every two years. They had from 10 to 11 miles of mains and service-pipes; the mains alone being from 6½ to 7 miles in length. Their total sales were about 6 million cubic feet, and their unaccounted-for gas was now 6 or 7 per cent.; but it had been as high as 20 per cent. They found that one of the gas-holders was accountable for a fair proportion of this leakage. When the painter went over it, he (Mr. Bowman) told him to watch for leaks; and he accounted for upwards of 200 small ones where the gas used to bubble out when he put the paint on. This was remedied. A great difficulty with all ordinary leakages was that they usually occurred under the footpaths. He had tried various plans, such as putting pipes round the service-pipes. In some cases they lasted a great number of years in this way; while in others they went very quickly. He found that the system of overhauling every two years, as applied to the whole network of mains, was the best way of keeping leakages within reasonable bounds. He believed that at Warrnambool the leakage was once as high as 40 per cent.; but it had been brought down as low as 7 per cent. The house meters were responsible for a fair amount of unaccounted-for gas. Supposing a 10-light meter was put into a house, on some nights only one light would be going. Sometimes the meter would register correctly when five lights were on, but would begin to go terribly slow when only one light was being used. A 3-light meter on a 15 cubic feet consumption per hour would go very well if three lights were on; but if only one light was in use, it would go very slowly.

Mr. W. SWINBURNE said in several small works they drove an inch steel bar by the side of the main, and put on the top of the hole a leak-indicator, which showed by a pointer the percentage of leakage. By driving holes along the main, and noting the difference in the percentage, they would arrive at the spot where

the leakages were taking place. By these means they had reduced the leakage in some towns very considerably indeed; and they had also adopted a similar system to the one described by Mr. Perkins—viz., inserting a meter at one end of a length of pipe, and cutting it off at the other end. They had also adopted, where the ground was soft, a crude method of driving a pick into the ground and smelling for a leak. With regard to what was a reasonable percentage of leakage, in his opinion it depended very much on conditions and circumstances, including the total consumption and the mileage of mains. But he thought that, as a general rule, the manager who could keep his leakage down to 5 per cent. was in a very happy position. In other cases, if it could be reduced to 10 per cent., the gas companies would be very well satisfied. He had something to do with the leakage at Warrnambool, referred to by the previous speaker, where there was 40 per cent. of gas unaccounted for. He sent a man down, and by the methods he had described he reduced the leakage first to 15 and later to 10 per cent., which was very satisfactory indeed. He considered house meters had more to do with leakage than was generally supposed. As Mr. Bowman said, a meter would register slower when it was not going to its full capacity. He had in his mind a case which occurred in South Australia, where the manager of the works had almost a mania—it was a very good one—for attending to his consumers' meters. He was always changing them. Owing chiefly to this, in these works they had the remarkable result of being paid for more gas than they made. (Laughter.) They had no leakage whatever, but an absolute surplus of gas. The station meter must be slow.

Mr. W. Ray stated that about twelve years ago he had works at Port Pirie where the ground was very bad indeed. Similarly to Mr. Swinburne's experience, for six years they had practically no leakage. They also had 2 per cent. of gas paid for beyond the quantity registered at the station meter. Of course, their leakage had gained after the six years to 10, 12, and 14 per cent. They had tried to grapple with the trouble by relaying long lengths of wrought-iron pipes, and had brought the leakage down to 10 per cent. If they did not watch it for a year or two, it went ahead again. With regard to meters, about twenty years ago they had a short Act of Parliament passed which he thought was a very beneficial one for the South Australian Gas Company. Previous to that they had always been chided by the consumers about the meters being said to be wrong; and when he offered to test them, they said: "Test them, indeed! We know all about your testing!" After the Act had been passed, he used to tell them that the Gas Company had nothing to do with the testing of the meters, but that there was an official tester at the Town Hall. It was illegal to fix a meter unless it had been officially stamped with the seal of the Corporation of Adelaide. His leakage last year was about 7½ per cent.; but it had been up to 12 and 13 per cent. He quite understood the force of what Mr. Bowman had said with regard to house meters. The makers, especially of dry meters, said they should be changed every five years. There had been a good deal of controversy on the house-meter question; but in a climate like theirs, he thought a dry meter had many advantages. They had one works in a place where there was a railway bridge (a swing bridge), and they had to disconnect the trunk main to one of the holders on a peninsula four or five times a day to suit the bridge operations; and this led to leakage. There was, of course, a difference between absolute leakage and unaccounted-for gas. Their gas was not standardized.

Mr. W. W. Morris said the plan he adopted at Benalla to find leakages was somewhat similar to that mentioned by Mr. Swinburne. It was a very crude method; but in the side streets he found it very successful. A man took a pick, and dug a bit of ground off the top of a main and smelt it. If he detected gas, they used a leak-indicator, and soon found the exact place. He quite endorsed what had been said as to meters, as a rule, registering slowly; and he had known cases, where only one or two lights were used, where they did not register at all. He quite agreed that no meters should be used for more than seven years without being tested. His leakage varied considerably. For six months it might be from 7 to 8 per cent., and then it would jump to 15 per cent. He supposed it averaged 10 per cent.

Mr. Ray said he should like to supplement his previous remarks. With regard to gas-engines, he had one or two cases where their pulsations had practically destroyed the diaphragms of the meters. He always insisted, therefore, on a considerable quantity of pipe being put in between the meters and the engines. It was specified in the agreement that should the engine pulsate in such a way that it affected any of the lights in the surrounding neighbourhood, the proprietor would put in a cylinder that would act as a cushion. When this was done it preserved the meter materially. It was rather a serious matter when they had a 150-light meter and the diaphragm became punctured. With their large gas-engines they always put in one of these cylinders. It was a notion of his own, and it had worked exceedingly well. It was a simple thing, and there was no trouble about it; the cost of making it being all that was involved. The contents were from 10 to 12 cubic feet.

Mr. A. T. Frost said that thirteen years ago, when he went to Beechworth, the percentage of leakage was extremely high—something like 25 per cent. After he had been there for a little while, he could not understand how it was. They examined the roads, and still could not find out. When he went there they had a fine station meter; but it had never been used by the man previously in charge. Nor did he make any returns to the Directors as to the quantity of gas made. This did not satisfy him (Mr. Frost). He sent the meter to Melbourne, had it repaired, and then found there was a large leak somewhere. He examined the pipes, the holders, and everything else, but could not discover it. He then found that it was with the house meters. His gas was different from coal gas, as he was manufacturing from kerosene, 150° test. Since then he had had the practice revised, and he made gas from crude oil with a little coal added. The oil gas had a certain effect on dry meters which the coal gas had not. Had the meters been syphoned in the first instance, it would have been all right. He advised the Company, as a number of the dry meters were old, to adopt wet ones. Since then he had had no trouble at all; and so far as the loss from unaccounted-for gas was concerned, he had proved that they only suffered from what was lost by condensation, which was far greater in oil gas than in coal gas. Their leakage was from 5 to 6 per cent.; but it was not from the mains. It occurred in a few dry meters they had still left. In Beechworth they could put down mains and take them up twenty or thirty years hence, and there would be no change in them. At first the illuminating power of his gas was very high indeed—65 candles; but it was now about 36-candle power.

Mr. T. Foster said that when he went to Oakleigh, about eight years ago, the leakage was 26 per cent., and the make of gas 100,000 cubic feet per month. They had six miles of mains. He treated the leakage exactly as Mr. Perkins had described, in sections, and reduced it to less than 10 per cent. in a few months, with very little expense. They had now about 12 miles of mains, and were making some 400,000 cubic feet of gas per month, with a leakage of between 5 and 8 per cent., varying according to the season. Wet weather had a good deal to do with leakage at Oakleigh, where there was a sandy soil. In the very dry weather, the ground would get porous and the pipes sweat a little. With reference to meters, he had made a point of finding out how many burners people were likely to use, and kept the meters as small as he could, consistently with the consumption.

This closed the discussion on the subjects in the "Question Box."

Correction of Make to Standard Temperature.

The President then announced that Mr. Hunt had a motion he wished to bring before the meeting.

Mr. Holmes Hunt said that, in the course of their discussions on the leakage question, and also in regard to the make of gas per ton for the current and the preceding year, an important fact seemed to crop up—namely, that the gas produced at the various works was not corrected to standard temperature, and that in consequence there was considerable uncertainty in dealing with the figures relating to the make per ton. It seemed to him that it was now time the members of the Association went in for correcting their makes to standard temperature; and when this was done, they would be in a proper position to make comparisons. Having in view this desirability, he begged to move: "That the members of this Association adopt the system of correcting the make of gas to the standard temperature of 60° Fahr." He felt sure that the move was one in the right direction; and if the resolution were adopted, he would be pleased to supply all the members with a correction table suitable for all temperatures likely to be experienced in the State, which would ensure the calculations being made in a simple fashion.

The President said he certainly thought it was a good idea. At the very inception of the Ballarat works, this was done; but he must say that, to a certain extent, it had fallen into disuse. When their new works were erected, they had thermometers all over the place. They did not cost much; and if they were used and the makes corrected, the comparative figures would be very much more valuable than they were at present.

Mr. T. Lord, in seconding the motion, endorsed what Mr. Hunt had said as to comparisons being quite valueless unless the makes were corrected to standard temperature. He added that at Geelong their gas was corrected both for temperature and barometric pressure.

Mr. W. Ray said, when he arrived in Australia, he used to standardize the gas; but the temperatures there were very different from those they had at home. When they ranged from 70° up to 100° Fahr., the question was when to take the temperature. He got so befogged about this that he procured a recording barometer and thermometer and took the temperature by the standard barometer. Of course, in some cases there was little doubt that the temperature could be taken satisfactorily; but when they had 96° at eleven o'clock at night, they would find, as he did, that when he wanted to use the correction table the temperature was out of range altogether. However, no doubt the table could be made to meet their varying circumstances at the different works.

The President said Mr. Hunt had made a very fair offer. He had told him that, if his recommendation should be endorsed, he would send out circulars to every member referring to the matter, and would eventually inform those who were using thermometers and correcting accordingly. He would also supply everyone with an extended correction table dealing with the high temperatures occurring in Victoria.

The motion was put and carried unanimously; and the proceedings ended, as already reported.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Engineering Association was held at the City of Birmingham Technical School, Suffolk Street, last Saturday afternoon, under the chairmanship of the PRESIDENT (Mr. James Hewett, of Birmingham). A busy afternoon was spent, for there were two papers down for reading and discussion. The subjects of the communications—which were both of a highly practical character—were of a widely different nature. The first, by Mr. G. C. Pearson, on "Pyrometry in Gas Manufacture," brought forward a subject of greatest importance to those engaged at any rate on large and medium works; while the other, by Mr. G. Ball, on "Main and Service Laying," contained many practical hints of value to all connected with the distribution department of a gas undertaking, however extensive or restricted may be the business carried on. The subsequent discussions were of somewhat unequal length; but there was, of course, much greater scope for the expression of opinion and the setting forth of experiences in regard to the matters dealt with by Mr. Ball, than was the case with reference to Mr. Pearson's interesting account of pyrometers and their uses.

PYROMETRY IN GAS MANUFACTURE.

By G. C. PEARSON, of Birmingham.

Before I attempt to describe any particular type of instrument suitable for the measurement of high temperature, I would like to draw attention to the great importance and benefit of the regular use of a reliable pyrometer in gas manufacture. The accurate determination of the temperature at which coal is carbonized, or of the various vessels of a water-gas plant, is a phase of gas making the advantages of which are seldom recognized at their true value. Many works use no pyrometer of any description; while others employ the instrument for making an occasional record for statistical purposes only. Some of these records of temperature—tests taken over a considerable period—are surprisingly uniform. This, to one who is acquainted with the subject, would at once arouse suspicion as to their reliability; for it is found impossible in practice to maintain the temperature in retorts to within 20° Fahr. above or below any desired standard with the ordinary means of regulation of settings. This difficulty is, of course, increased by the carbonizing of different coals incurring, with hot firing, the use of a different fuel.

A report which came under my notice some little time ago, of tests taken of the temperature of retorts over a period of three months, during which time six different coals were in use, two observations being taken on each of sixteen days during the period, shows but an average daily difference of 3° Fahr. The maximum difference of the daily averages was only 11° Fahr.; while the lowest temperature recorded was 1700° Fahr., and the highest 1723° Fahr. These records are really absurd in their uniformity. To have maintained so even a temperature over so long a period would have been nothing short of a miracle; and the credulity of a person intimate with the subject would be severely strained by such figures.

The use of a pyrometer should not be confined to the making of a record of temperature; but the observations should be utilized as a guide for the adjustment of slides and damper necessary for the regulation of the settings. The importance of this has of late been emphasized by the almost universal adoption of high-temperature carbonization. On large works where water gas or other enrichment is at hand, or on works where the parliamentary standard is reasonably low, it is often economical to raise the retort temperatures as high as is possible without catastrophe to the settings; the value of the greater volume of gas thus obtained more than balancing the loss due to fall in illuminating power. It is of primary importance that retorts maintained at such high temperatures should be evenly heated. There is little doubt that many so-called high temperature troubles—such as naphthalene, stopped pipes, thick pitchy tar, &c.—result more from uneven heating than any other cause. The degree of accuracy to which it is possible to regulate such high temperatures by the eye, is insufficient for good working; and a good and reliable pyrometer is indispensable. To attempt to ascertain the temperature of a retort by glancing along its length is misleading. Experienced men who are regularly viewing retort temperatures will easily be 100° Fahr. out in their estimate; and this 100° will probably mean either the loss of the important few extra cubic feet per ton or the close approach to a temperature dangerous for the settings. It is a usual thing to class retort temperatures as merely good or bad—meaning that the charge has the appearance of being free from gas or not. To say that a charge of coal is "burnt off" or fully carbonized is not scientific. One should say that the charge is fully carbonized at a particular temperature. An increase of temperature would mean different results, though the increase may make little difference in appearance.

It would come as a surprise to many men should they be told that they were unable to estimate temperatures by observation to within 100° Fahr. It must be understood that this remark applies more particularly to high temperatures—*e.g.*, 1780° Fahr., and upwards, and also it is interesting to note, to low temperatures—*e.g.*, 1630° Fahr., and lower. The middle temperatures—*e.g.*, 1630° to 1780° Fahr.—an experienced person, constantly viewing retort temperatures, may estimate with comparative accuracy. The observer judges by the colour appearance. At low temperatures, the colours are shades of dull red; a few degrees, higher or lower, making no perceptible change. To judge these shades with any nice degree of accuracy is exceedingly difficult, not to say impossible. At middle temperatures, the actual change from dull red to bright red, verging to white heat, is taking place; and for every few degrees increase of temperature a marked difference in the colour takes place, so that it becomes possible, with a little practice, to estimate within small limits. At high temperatures, the colour rapidly approaches white heat; and for rise in temperature, an intensification of glare, but little difference in colour is observable. As the temperature rises, the difference in appearance due to a few degrees becomes still less, and the difficulty of judging more pronounced.

As an illustration of the difficulty of judging temperatures by eye, I quote a practical example: Six men, all of whom were in constant practice in the viewing of retorts, were asked to estimate the temperatures of six drawn retorts. The results (which were checked by means of a Féry radiation pyrometer, such as is to be described later) were as follows:—

Actual Temperature by Féry. Deg. Fahr.	Observers' Deviations from Féry Reading.						Average Deviation.
	1	2	3	4	5	6	
1845	− 25	− 25	− 85	− 75	−105	− 15	55
1780	− 20	0	+ 30	− 30	− 50	− 30	27
1790	− 10	− 10	− 20	− 40	− 40	+ 40	27
1895	− 85	− 75	− 95	− 95	−125	−125	100
1575	+ 25	− 25	+195	+165	+175	+155	123
1295	+105	+155	+155	− 35	+205	+105	127

CLASSES OF INSTRUMENTS.

It is thus seen that for the maintenance of high and even retort temperatures a good and reliable pyrometer is really needed. It remains to choose a suitable instrument. Pyrometers may be roughly divided into two classes: (I.) Where some portion of the apparatus, either sensitive or receptive, is caused to acquire the actual temperature to be measured; and (II.) optical and radiation pyrometers. An immediate disadvantage of the first class of instrument is that considerable time—five minutes or more—is necessary for the sensitive or receptive portion of the instrument to acquire the temperature of its surroundings; whereas with instruments of the second class the temperature may be read with little delay—it being possible to obtain the temperatures of every retort opened in a large retort-house without delaying the drawing and charging operations in any way. Again, most of the instruments of Class I. have a temperature limit of 1000° C. (say, 1830° Fahr.), whereas those of Class II. have no practical limit. The advantage of this greater range is that combustion chamber temperatures may be observed through the sight-hole in the front wall of the setting; and at the Saltley coal test plant, we have found this observation a most valuable guide to the regulation of retort temperatures. A maximum temperature, much above which it is dangerous to work (1270° C.), is fixed for the combustion chamber. Should the temperature in the night time appear to the chemist in charge to be either too high or too low, he takes a reading of the chambers and regulates accordingly by means of the main damper. He is not authorized to alter bed dampers or slides. This reading may be taken at any time, regardless of the working of the house, and may be accomplished in a few moments, thus rendering it possible to work retorts at a high and an even temperature.

A disadvantage of instruments in Class II., and to a less degree of those in Class I., is that it is possible to obtain a false (an increased) temperature in the case of a retort coated with retort carbon or scurf, if exposed to draught by reason of the lids being open. The scurf is caused to glow and attain a temperature greater than that of the retort; and the reading of the pyrometer is too high. This error would be greater in the case of inclined retorts when the bottom lid is open. The temperature of an inclined retort should be read at once from the higher stage; the bottom lid being closed. As a practical illustration of the error due to glowing scale, I may quote the following: A retort known to be well coated with scurf was drawn. A Féry pyrometer was immediately sighted; and a temperature of 1850° Fahr. was recorded. A fire-brick was placed in an upright position inside the retort, and allowed to remain for 15 minutes; both retort-lids being opened during the last 5 minutes. The temperature of the brick was then read and showed 1845° Fahr.—a temperature a little lower than that of the retort reading. The side of the retort was next sighted; and the reading was 1910° Fahr.—this large increase being greatly due to the glowing of the carbon scale caused by the combustion set up by the current of air passing over it. A drawn or empty retort will, as may be expected, rise some few degrees; so that the recorded temperature of the brick is perhaps a little low. But the experiment most successfully illustrates the case. With instruments of Class II. an observer should therefore be careful to obtain retort temperatures immediately after drawing; and in the case of through retorts, he should see that the opposite lid is closed and air currents generally avoided.

METHODS AND INSTRUMENTS EMPLOYED.

I will describe and discuss some of the methods and instruments employed in the determination of temperature.

Indication by Fusible Materials.—Under this heading may be mentioned Seger's cones, Watkins's heat recorders, and others of a similar kind. They consist of fusible mixtures—generally

clay, sand, and fluxes—of known melting point. Metals are similarly used; and as in the case of pure metals the melting-point is definite, they may be employed to check the readings of other pyrometers. The fluxes used are generally soda and lead oxide; boric acid being utilized for high temperatures. The mixtures are made up in the form of cones or pellets each being numbered; a table supplying the fusing-points. It is usual to employ several of these cones or pellets; and the temperature is assumed to lie between the melting-point of the last-fused pellet and the first unaffected one. It is thus possible to obtain a rough idea of the temperature of a retort; but it is a troublesome and unscientific determination, and impossible to adopt on a large scale because of delay to charging operations. It is also costly—Seger's cones being 3d. each. As a matter of interest, a comparison of results obtained from Seger's cones and from a Féry pyrometer are here given. Four cones were used, Nos. 04 to 07.

No. of Cone.	Melting Temperature from Table. Deg. C.	Effect on Cone.	Temperature by Féry. Deg. C.
04	1070	very slight	1050
05	1050	greater	
06	1030	fused	
07	1010	fused	

Siemens's Water Pyrometer.—The instrument for temperature determination in most general use upon gas-works is Siemens's water pyrometer, belonging to Class I. There is little doubt that until recent years, this instrument supplied the most convenient and practical method of ascertaining retort temperatures; but though its use in the past may now be fully acknowledged, in face of the present scientific developments in apparatus for the measurement of high temperature, it should be allowed an honourable retirement. It will be necessary to give but a very brief description of this instrument. It consists of a copper calorimeter fitted with a thermometer and specially graduated brass scale. A measured quantity of water is placed in the calorimeter, and the zero of the brass scale adjusted to the height attained by the mercurial column of the thermometer. A bob of particular weight (generally of iron) is placed in the actual zone of heat until it is assumed to have attained an identical temperature. The bob is then taken out, usually by means of tongs, and dropped into the calorimeter. The full extent of the rise of the mercury is noted on the thermometer and on the brass scale—the sum of the two readings indicating the temperature. The sources of possible error are numerous. The specific heat of iron, owing to its variable composition, is uncertain; it is assumed that the bob fully acquires the temperature of its surroundings; an iron bob is immediately covered with scale on heating, part of which probably drops off, causing the weight to vary; a fall of temperature must occur during the manipulation of the bob, even should the rakes, rods, and tongs be heated; and there may be the loss of a little water from disturbance of the surface as the bob is immersed. Added to the above is the important fact that the determination occupies some 15 minutes, and the temperature recorded is that of one particular spot. Thus, in the case of a retort, no idea of average temperature is conveyed. It is, perhaps, only fair to say that, in spite of all, it is possible, should every care be taken, to obtain a reading within a fair margin of the actual; but the trouble and time involved condemn the instrument as unsuitable for modern gas-works practice.

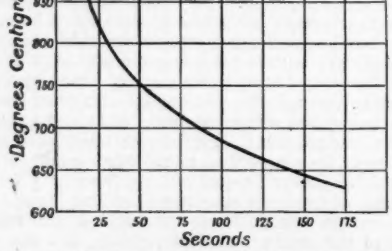


Fig. 1.—Curve Showing the Rate of Cooling of an Iron Bob.

The following table gives retort temperatures as recorded by Siemens's water pyrometer and the Féry pyrometer. In Case I., two bobs, and in Case II., three bobs, were placed together in a retort; the Féry being focussed directly on the same spot when the bobs were removed. The greatest possible care was exercised in the experiment. The unreliability of the water pyrometer is clearly shown in the variations of its estimations.

–	Siemens's Water Pyrometer.					Reading by Féry. Deg. Fahr.
	Estimations, Deg. Fahr.			Greatest Difference.	Average Reading.	
	1	2	3			
Case I.	1806	1878	..	72	1842	1852
,, II.	1827	1838	1792	46	1819	1855

The curve produced gives the rate of cooling of an iron bob. The readings were taken every 5 seconds by means of a Féry pyrometer. It is noticeable how rapidly the temperature falls while the bob is above 800° C. From 950° to 890° C., the fall is at the rate of 6° C. (11° Fahr.) per second.

Incidentally, the above shows the "flexibility" of the Féry instrument.

Thermo-Electric Couples.—The fact that the heating of a junction of two wires of different metals sets up an electric current, the electro-motive force of which is proportional to the degree of heat, is made use of for the determination of temperature. Such a junction is called a thermo-couple. The electro-motive force produced is measured by means of a delicate galvanometer. The metals principally used in couples are platinum with platinum-rhodium and platinum with platinum-iridium. The wires should be fused at the junction, carefully insulated, and be enclosed in a casing of refractory porcelain or iron tube. Insulated copper-wire connections are laid to the galvanometer, which may be at a considerable distance from the couple. This form of pyrometer is capable of a high order of accuracy; and in a case where it is possible to permanently fix the couple in the actual zone of heat, a continuous and reliable record may be obtained. It is eminently suited for use on a water-gas plant or in flues, chimney-stacks, &c. For retort-house work, it is not so suitable. The time occupied obtaining a reading of 1000° C. is some 7 minutes; and the couple is likely to quickly deteriorate or be damaged at such high temperatures. It is necessary that the casing of wires and junction should be at least 5 feet—a cumbersome length—and even then there is great possibility of error arising from the heating of the head where the junction of the platinum and the copper wires forms another couple. The question of casing also comes into consideration, as porcelain is very costly and liable to damage. Iron at a high temperature would seem to have some effect upon the wires and junction; these becoming brittle after but little usage. I am told that very different readings are obtained from couples encased in porcelain and nickel respectively—so much so that nickel is unsatisfactory for the purpose. It is quite conceivable that iron at high temperatures may have a similar effect. The thermo-couple is thus seen to be a delicate and accurate instrument, but unsuited for use in retorts.

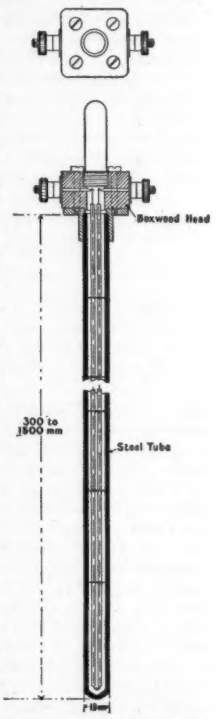


Fig. 2.—Thermo-Electric Thermometer.

An ingenious recording galvanometer has been devised by the Cambridge Scientific Instrument Company for use with thermo-couples and the Féry pyrometer. It consists of a galvanometer the needle A (fig. 3) of which is depressed at regular intervals upon an inked thread G, which it forces upon a paper fixed around a revolving drum; the whole of the movements being controlled by clockwork. If desired, the clockwork may be used to depress several galvanometer needles simultaneously. Provision for the reading of direct temperature is made by means of a scale upon a cross-bar D, with which the needle comes in contact. A series of records made with this instrument in conjunction with a couple fixed in one of the vessels of a water-gas plant would no doubt be of great interest and practical value; but I regret that I have none.

Resistance Pyrometers.—Many of the remarks under the last heading apply to this form of pyrometer. Its construction is based upon the principle that the resistance offered by a wire to the passage of an electric current is increased as the temperature to which the wire is subjected is raised. Fine platinum wire is generally used; and a length of this is wound on a mica frame and enclosed in a casing similar to that employed for thermo-couples. The current necessary for the working of this apparatus must be supplied from an outside source, usually cells, and must be controlled by a suitable variable resistance. The Whipple patent temperature indicator is an instrument for use in conjunction with the resistance pyrometer. By the turning of a milled head, a contained resistance may be adjusted to equal that of the platinum coil as indicated by the galvanometer-needle assuming the position of zero. When this balance is obtained, the actual temperature to which the platinum coil is subjected may be directly read from a moving scale the reading on which varies with the amount of resistance needful for obtaining a balance—*i.e.*, with the turns of the milled head. This form of pyrometer is perhaps the most accurate for temperatures below 900° C.

The Wanner Pyrometer.—The optical pyrometer introduced by Professor H. Wanner has met with a large measure of success on the Continent; but its use in this country is perhaps not very common. Its principle depends upon the comparison of the light

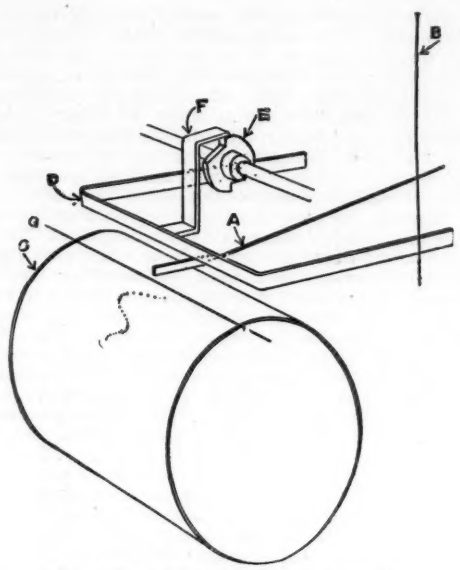
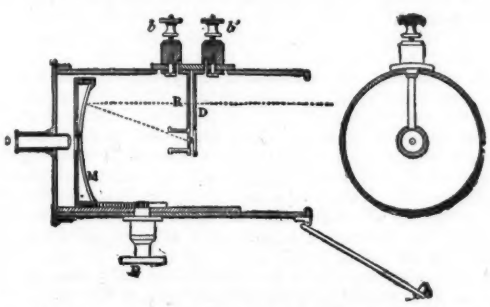


Fig. 3.—Essential Parts of a Thread Recorder.

intensity of the heated body with that of a constant standard of illumination. The apparatus consists of a photometer tube, with a handle fitted at right angles and containing a small comparison electric glow lamp of about 2 volts. The current is supplied by an accumulator cell; the light being adjusted by a small resistance. A Hefner amyl-acetate lamp is supplied as a standard for the control of the glow lamp; also a suitable stand to bring the photometer tube in front of the Hefner lamp. The glow lamp needs standardizing, as noted above, before use; the Hefner lamp requiring to burn for 10 minutes in order to get a steady flame. The heated body is viewed through the photometer tube; and on looking through this tube the illuminated field is seen to be divided into two halves, the brightness of which may be equalized by the turning of a micrometer screw. The movement of this screw affects a circular scale; and by means of a table, the temperature of the heated body may be found. I can claim no acquaintance with this pyrometer, but should say its chief disadvantage lies in the fact that the element of personal error is introduced. It is said to be rapid and reliable in its readings.

The Féry Radiation Pyrometer.—This is one of the most convenient and satisfactory instruments yet devised. It is made in two varieties—the mirror pyrometer and the lens pyrometer. Both types are based upon the same essential principles. The hot body is sighted through a telescope, and the radiation emanating from the body is brought to a focus by means of a con-

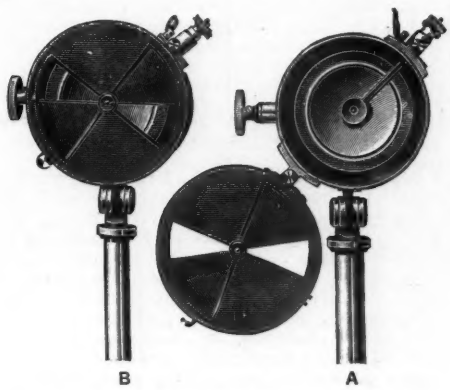


R and D are brass strips supporting the thermo-couple. b and b' are terminals for connection to the galvanometer. M is the mirror. O is the sighthole into the telescope. P is a milled head, the manipulation of which adjusts the focus.

Fig. 4.—Féry Radiation Pyrometer Telescope.

cave mirror or else a lens, upon the junction of a copper constantan thermo-electric couple arranged in the form of a + (cross) within the telescope. This thermo-junction is suspended upon brass strips connected to the body of the telescope. A delicate galvanometer and 33 feet of armoured cable complete the apparatus. It is possible, by focussing, to raise the thermo-junction to a temperature proportional to the radiation emitted by the hot body; and the electro-motive force thus generated is measured by the galvanometer, the scale of which is graduated to read temperature directly. An important fact is that in no case does the actual temperature to which the couple is raised exceed 80° C. The possibility of loss of heat by radiation from the instrument itself is thus reduced to a minimum, and the life and efficiency of the couple is practically unlimited.

Provision is made to obviate the error arising from variation in distance of observation. Should the whole of the radiation focussed by the mirror be converged so as to fall within the area of the surface of the thermo-junction, then the total effect of radiation would vary inversely as the square of the distance of observation. But for practical determination, it is necessary for the image formed by the mirror to overlap the junction on all sides. To decrease the distance of observation is merely to increase the area of the image, and conversely. The area of the image will also vary as the inverse square of the distance of observation, thus equalizing the variation in the effect of radiation over equal distances. It is but necessary to be within a sufficient distance to obtain an image the area of which slightly overlaps the thermo-junction; and this distance is, at the greatest, 24 times the diameter of the body under observation. The range of distance possible in a retort-house is quite suitable. For the purpose of increasing the range of temperature possible to be recorded by this instrument, a diaphragm is placed in front of the receiving mirror, thus reducing the radiation falling upon it. The radiation falling upon the couple in this case is, of course, proportional to the area of the aperture in the diaphragm. An



A, Féry in use without diaphragm. B, with diaphragm.

Fig. 5.—Féry Diaphragm.

aperture of fixed area is provided, and an extra scale is placed on the galvanometer for use with the diaphragm. By diminishing the area of the aperture, and deducing the reading accordingly, temperatures of the highest magnitude may be read.

The Féry is an almost ideal instrument for use in gas-works. It is possible to take any number of readings of a retort; the temperatures being recorded almost instantaneously. Its great merit lies in its adaptability and large range of temperature. The accuracy of the instrument is of a high order. It may appear at first to be an apparatus too delicate for use in a retort-house; but it is a fact that the Féry on view has been in constant use during the last two years. When following a drawing machine along the length of a large retort-house, the moving of the galvanometer and the manipulation of the armoured cable cause a little trouble; but this may be obviated to a great extent by having a connection laid along the retort-house wall to some convenient position for a galvanometer—provision being made (such as mercury cups or terminals) for connection to the pyrometer at various places along the wall.

The Spiral Féry.—This new form of Féry radiation pyrometer has lately been devised, and is in many respects like the old. But instead of the radiation being focussed on a thermo-couple, it is thrown on a flat spiral. This spiral is cut from a sheet made of two dissimilar metals of unequal expansion, soldered together. It is very small, to allow of its use over observation distances similar to those of the old pattern. The spiral is supported centrally on a small steel stem carried from the body of the telescope; the outer end of the spiral carrying an aluminium pointer. The spiral is coated with a special form of black, so that it may absorb as large a quantity of heat as possible. Any radiation passing through the convolutions of the spiral is reflected back on to the spiral by means of an extremely small mirror fixed behind. The spiral expands or contracts as the temperature is raised or lowered; the aluminium pointer moving over a scale which is graduated in degrees of temperature.

In order to eliminate errors which may arise through change in the actual temperature of the apparatus, an adjustment is provided by which the scale or the plate may be deflected—thus bringing the needle to zero. The effect of alteration of temperature in the instrument is seen when in use. The first maximum to which the needle rises is the true indicated temperature. The needle will be seen to hesitate and stop; but shortly a rise of temperature in the apparatus as a whole begins to take place, and the needle is deflected higher. Should the rays be now shut off from the spiral by the closing of the shutter, the needle will be seen to return to the number of degrees above zero to which it rose above the true temperature. Before a second reading is taken, it is necessary to adjust to zero. Should the instrument be left in position, it will in time attain in itself a maximum temperature, and this adjustment will not be required.

The great advantage of this new instrument over the old is that it is self-contained, no galvanometer or wires being required; and this means a great deal in gas-works use. The instrument

is not so scientific an apparatus as the old form, and could hardly be expected to be as accurate. It is, however, quick in its readings, and, I think, reliable enough for the indication of retort temperatures. It would be an advantage were it possible to construct this instrument in a lighter fashion, to admit of its being carried by hand. Also, if it were possible to obtain a focus with the spiral out of action, the focus then being directed upon the spiral by means of the opening of a shutter or other arrangement, it would perhaps be a help in reading. The instrument as it stands is, however, very useful.

Below is a table giving results in degrees Centigrade as recorded by the old and new forms of the Féry pyrometer. I should mention here that the old type Féry used in this instance was standardized at the National Physical Laboratory.

Féry.	Spiral.	Difference.	Féry.	Spiral.	Difference.
990	990	0	995	1000	+ 5
930	940	+ 10	980	978	− 2
1000	1005	+ 5	1210	1218	+ 8
1020	1020	0	1225	1220	− 5
1250	1200*–1270	..	1250	1250	0
1240	1238	− 2	845	840	−
1260	1260	0	..	..	..

* Variation due to draught, to the effect of which the new instrument would appear to be much the more sensitive.

It is of importance in the use of all radiation pyrometers to remember that the heated object should be what is termed a "black" body—*i.e.*, a body devoid of reflecting power, or one that absorbs all rays falling upon it. Bodies possessing the power of reflection radiate heat more slowly than those which do not, and consequently indicate on a radiation pyrometer a lower temperature. Carbon and all metals which form black oxides are, to all intents and purposes, perfectly black; while enclosed furnaces, muffles, combustion chambers, &c., may be also considered as "black" bodies. In the reading of a combustion chamber which is of the same general temperature, the observation-hole being moderate in size, the radiation is quite independent of the brickwork surfaces; and it is unnecessary to converge the rays from any definite position. Actual flame appears to have little or no effect on radiation instruments; but they are instantly and seriously affected by the interposition of condensed steam or smoke.

For obtaining the temperature of bodies other than "black" bodies, and also extremely hot, small bodies, incandescent filaments, &c., the Féry absorption pyrometer may be used. It is an improved form of optical pyrometer.

I have already been asked several times to explain exactly in what manner the cooling temperatures of the Siemens's bob was determined (fig. 1); and I think it would be well to acquaint the meeting of this before concluding. An iron bob was fixed upon a stout wire and placed in a combustion chamber. The wire was then held by means of a pair of tongs and the bob kept in a steady position by placing the tongs upon a rest. The Féry was focussed upon the bob, and readings were taken of the galvanometer every 5 seconds. The question arises, Does the bob sufficiently fulfil the conditions of those of a "black body" to admit of the use of a Féry pyrometer? It must be remembered that the surface of the bob was coated with scale, causing it to be at least a partial black body. Also, should the temperature recorded be not strictly accurate, the readings would still be comparable, so that the curve would remain true, and the experiment is successful in proving its object.

Discussion.

Dr. W. B. DAVIDSON thought that they must all congratulate Mr. Pearson upon his very useful paper, in which he had given them a concise account of modern pyrometry. Probably, it was not a paper that was open to much discussion. The main point to be discussed was the utility of the pyrometer. Was it worth while to go to much trouble or expense to take retort temperatures? His experience was that it certainly was worth the work and outlay. If they wished to get the very best results—and they could only do so by high temperature, and he might say with large charges—they must sail as close to the wind as possible. They must keep as near the best conditions of temperature as was consistent with safety to the retort-settings; and they could not rely upon the word of the stoker or the word of the foreman. He had frequently found that the stoker was very far out in his judgment; and to take his word for the temperatures would result in the making of a poor show. He did not quite agree with Mr. Pearson when he said it was found impossible in practice to maintain the temperature in retorts at a constant figure, or within a limit of 20° Fahr. He (the speaker) thought that, with the same coal, the same charges, and careful regulation and supervision, it was possible to do so. Perhaps Mr. Pearson meant with mixtures of coals in varying proportions. Gas manufacture was becoming less and less a rule-of-thumb process, and more and more scientific; and as they were striving year by year to attain the highest possible results, they must employ the most scientific methods to aid in securing what they were aiming at.

Mr. H. E. STONE (Birmingham) said there were one or two points in the paper to which he would like to refer. The author alluded to the effect on radiation instruments of the interposition of condensed steam. He did not know why "condensed steam" had been singled out in this way, because it was well known that moisture in any form seriously absorbed radiation and so affected the pyrometer. Therefore it did not matter whether it was condensed steam or true steam or even water. He almost wished that Mr. Pearson had emphasized this point more, because it was rather a serious thing. When coke-quenching operations or anything like that were proceeding under the mouth of the retort, one could not get a true reading, because the water vapour and all that arising from the quenching of the coke was sure to affect the instrument. The carbonic acid from the coke was also an absorber of radiation; and so they had to be careful of this as well. However, in many houses, of course, they did not have the coke quenched just underneath the mouthpieces. The author said that actual flame appeared to have little or no effect upon radiation instruments. But when the flame was between the instrument and the retort, it would affect the result, by absorbing some of the radiation. He thought, however, that Mr. Pearson meant actual flames in the retorts—say, gases burning through cracks. But if the instrument was focussed on any point where there were these cracks, one would not get a true measurement, because one would be measuring the radiation from the flame, and not from the retort—which was quite a different thing.

Mr. J. STURGES (Smethwick) inquired whether Mr. Pearson could give them the approximate cost of the Féry radiation pyrometer; and if he could tell them whether it would be worth while adopting the instrument on one of the smaller works—say, works with a make of 500 or 600 million cubic feet a year.

The PRESIDENT (Mr. J. Hewett), in proposing a hearty vote of thanks to the author, remarked that certainly the paper had not given rise to a very long discussion; but then Mr. Pearson had dealt so fully with his subject that there was very little left to be said without going outside it. Dr. Davidson had hit the nail on the head, when pointing out that the question was whether it was necessary to employ such an instrument—whether an adequate return could be obtained from its use. He himself quite agreed that there was room for it. With regard to the estimation of temperatures by personal observation, it seemed to him that unless a man had an instrument by means of which he could correct his observations periodically, his conclusions would amount to no more than an idea. Therefore such a man must have an instrument at times to ascertain whether his observations were really in accord with actual facts.

The HON. SECRETARY (Mr. H. E. Temple), in seconding the proposition, said he had during the past few days had an opportunity of using some of the new appliances, and he could quite appreciate everything the author had said. With regard to the Whipple resistance apparatus, he had used this for determining the temperature of the waste gases at the stack of the water-gas plant, where there was no flame present and no heated surface for using the Féry pyrometer, and where there would not be sufficient time to heat up a bob for the Siemens water pyrometer. He found that the temperature could be taken very quickly. In the three or four minutes available, it was impossible to get a proper reading with the older apparatus; but with the Whipple indicator they were able to obtain in a very few minutes readings with practically no variation at all.

Mr. PEARSON, after acknowledging the vote of thanks accorded by the members, proceeded to reply to the points raised in the discussion. With regard to the remarks of Mr. Stone, as to condensed steam, he said that he mentioned this in the paper because it was the only sort of steam that could be seen. With water vapour that was invisible, one would not know that there was any interposition taking place. But, of course, it would have the same effect whether the steam was visible or not. With reference to his statement that there was little or no variation caused by flame on radiation instruments, he had noticed that in the case of flame coming down the ascension-pipes, if the pyrometer was focussed on the retort, the flame hardly deflected the needle at all, and made very little difference to the reading. As regarded the use of a pyrometer on a gas-works, he thought there was no doubt at all about its value. It was only necessary to employ one for a few months to fully realize its usefulness; and it would be very difficult to get on without it afterwards. It was impossible to regulate settings to a nicety without a pyrometer—this much was quite certain. In the case of combustion chambers, differences in temperature which would otherwise appear to be small might be found to be substantial when a pyrometer was used; and then the dampers could be properly adjusted. He thought the chamber reading was a very valuable one indeed. They had found it so on the Birmingham coal-test plant. The cost of the Féry instrument was about £27; and he was certainly of opinion that it was worth while going in for one on a medium-sized works, because when once the instrument was procured, it would stand a lot of hard wear and constant use. The one they had at the Birmingham coal-test plant had been in considerable use for several years; and it was quite good now.

[Mr. Pearson showed some lantern slides of apparatus referred to in his paper; and at the conclusion of the meeting, the members inspected with interest a number of instruments which had been arranged in the room for the purpose.]

PRACTICAL HINTS IN CONNECTION WITH MAIN & SERVICE LAYING.

By GEORGE BALL, of Birmingham.

One of our most important aims in my opinion is to keep down the unaccounted-for gas. There are several ways of doing this; the first being to systematically bar the unpaved roads in which

mains and services are laid, for leakage. A commencement should be made upon the streets which contain the oldest mains and services; for here we may expect to reap the greatest benefit for the outlay. This work can best be done during the summer months, and does not necessitate a large gang of men. All that is necessary are two or three men with a light handcart and some tools—such as a sledgehammer, steel bar, pick, shovel, a few setts and rammer, and reserve tools in case of breakage. When it is only necessary to reset up joints, the work can be done at once; but where the fault is due to fractured mains, &c., the man in charge would communicate with the works for more strength and the necessary materials.

Another source of loss of gas, in my opinion, is in drilling or cutting holes in the mains for service-pipes or other purposes. In all cases the man in charge of the work should be instructed to put a yarn washer round the rimer when rimering out the hole; also to fill up the hollows in the tap with tallow when tapping the holes, and to clay or plug up the holes in the main as soon as possible after these operations are completed—not leave the gas blowing into the air, while he goes about 20 yards to the cart for some necessary tool or fitting to do the job with. In one minute, a ¾-inch diameter tapped hole will pass, at 18-10ths pressure in the main, 25 cubic feet, which equals 1500 cubic feet per hour; and assuming there are (say) twenty to thirty holes a day put in the mains, the waste of gas in the course of the year would be considerable, and increase the unaccounted-for gas.

Where possible, all services should be laid with a fall to the main, with a minimum depth of 16-inch below the ground-level. The wrought-iron tube or fitting should in all instances be plugged or capped at the opposite end from that which is being screwed into the main—thus reducing to a minimum the chance of gas blowing into the air. For cast-iron services a gas-bag or bladder should be used to keep the gas back during the progress of the work. It will be found a great convenience to fix a valve in addition to the one near the meter, on all size services of 2 inches diameter and upwards, within 6 inches of the kerb-line, for shutting off the gas when executing repairs to the portion of the service between the valve and the inlet of the meter, and for shutting off the supply in case the premises are on fire. Laying wrought-iron services in wooden troughs filled with tar which has been previously boiled, and a little lime added during the process to kill the acids, will add considerably to the life of the tube.

Another very important point is to have all main-pipes properly tested at the foundry before they are coated. My advice for gas-mains is to only coat the pipes outside, leaving the spigot end bare for not less than 6 inches, and also the face of the socket. Coating the pipes outside and inside, or, in other words, dipping them, causes trouble, as on letting the gas into the main the tar is dissolved, and works its way through the bottom of the joints. This causes escapes, and is another means of swelling the unaccounted-for gas. This necessitates opening down to the joints and resetting them up, which operation will probably have to be performed several times before the joints remain sound. The dissolved tar also runs down the main into the syphons, and blocks them. It may then be necessary to take off the top of the syphon, to clear out the tar that has collected. Before doing this, however, it is advisable to add about a quart of carburine, or some other spirit, into the syphon, to see if it will dissolve the tar sufficiently for it to be pumped out. This I have done successfully on two or three occasions.

In main-laying, it is always advisable to lay the pipes at a minimum depth of 2 feet to the body of the pipe, and have a good jointer on the work. For large mains, at least half the depth of the socket should be filled with new lead, after the yarn has been well driven home with a hammer. Personally, I prefer white to tarred yarn. For the smaller sizes—say, 2 inches to 10 inches—not less than a depth of 2 inches of lead in the socket should be allowed; all joints to be run in one running. Should a joint be missed in running, it must be cut out and re-run, not filled up. If the jointer is not carrying out these instructions, he should be got rid of. Only by good work can the unaccounted-for gas be kept down. When laying mains, it is advisable to lay them dead if possible, and to see that the pipes are well home in the sockets, so as to avoid the yarn passing by the end of the spigot. The main should be tested with air (say), every 200 yards, to 30 inches of water, or, if preferred, each day's work can be tested. In all cases the gauge should stand at least 30 minutes without loss. It is just possible, if the temperature of the air within the main falls during the test, the gauge may fall as much as 1-10th or 2-10ths. If the gauge falls, and you have reason to believe the temperature has fallen, as before stated, the temperature should be taken by inserting a thermometer case into the main, which will, of course, necessitate blowing-up the main again. In case of a length of main not standing the test, so that the work of laying the main can be proceeded with, leave a gap the length of a pipe without the socket, or, if you have any double spigot pipes in stock, leave the length of the one you intend to use; the latter will save time in cutting and waste of material. The final test of a main should be for a period of not less than one hour without any loss on the gauge—correcting for temperature if necessary. It may be asked, Why not use a mercury gauge? My reason for using a water-gauge is that it is quicker for detecting leakage.

In laying services, when wrought-iron tubes are used, all sockets should be taken off, and the threads on the ends of the tubes well smeared with a mixture of red and white lead, mixed with boiled oil and small quantity of gold size, or any other kind of paint specially prepared for this class of work. A small quantity should also be smeared just inside the socket or fitting before the thread is screwed in. Care should be exercised in doing this, as, if too much is inside the socket or fitting, when set-hard it may cause at some future time a stoppage, particularly if there is any naphthalene about. A long screw and back-nut, or in other words, a connector, should in all cases be fixed near the main; the best place being next to the bend or elbow which is screwed into the main. In finally making the back-nut good, a thin strand of yarn should be used as a washer between the back-nut and the socket. For services laid across the full width of the road (there being no cellar to the house), and a bend and upright is used where the service enters the house, it is advisable to have a standing rule for an "L S and B" nut to be fixed in addition to the one at the main. In unpaved roads, they should be arranged near the gutter paving, and in paved roads near the kerb, under the footpath. In case of a stoppage, the connectors can then be easily disconnected without a lot of ground being disturbed, and will in the end save money. For services to premises without cellars, or with cellars at the back only, I think, in the interests of the department you serve, it should be advocated that, where there is no front cellar and the floor is wood, with a space between the floor boards and the earth, no gas service-pipe should be laid under the floor, as at some future time it may lead to a very serious accident. In no case should a gas service-pipe be laid under a front room floor to a back cellar. Of course, builders are likely to object to the pipe being put on the outside of the wall. This can, however, be easily overcome by turning in with the service pipe just above the floor level, as shown in Diagram No. 1; the idea of the special bend being to avoid having a thread in the wall.

Another very important matter is the way holes are made in the mains for services or bag holes. These holes should be drilled in all sizes of mains up to and including 6 inches in diameter. Above this size they can safely be cut—not punched or knocked in. Care must, however, be taken to get a good hole for rimering. Diagram No. 2 shows the difference between a bad hole and a good one. No under-cutting of the hole should be allowed, as it is impossible to get a good thread unless the hole is properly made as shown at A. A bad hole, caused by under-cutting as shown at B, only leaves about half the thickness of the pipe for tapping. A is a well rimered hole, not having been cut too large to start with; the point of the rimer only just entering the hole at the commencement. B is a hole punched or knocked through, easier and quicker for the service layer, but of bad workmanship, and liable to cause leakage through not having a proper thread in the main. Further, knocking through holes in a careless manner is liable to split the main.

Owing to the general introduction of gas-stoves into dwelling houses, gas-engines for power, japanning stoves, &c., unless the mains are well tied round, it is not safe to cut out any mains for the purpose of repairs or fixing additional branches without first knowing the position as regards keeping up the full supply of gas. It is very annoying to consumers to find that at noon there is insufficient gas to cook with, particularly in the summer months, when they have no fires. This can be avoided by testing with a gauge, by putting three holes in the main (the two outside ones being used afterwards as bag holes, if a small main), fixing

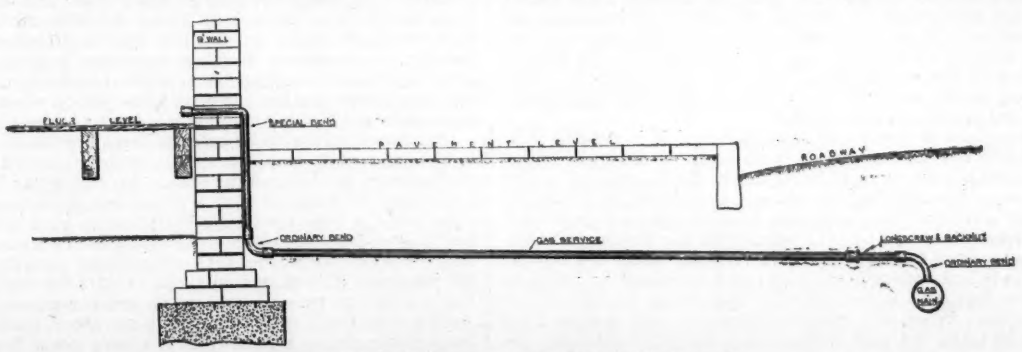


Fig. 1.—Arranging a Service-Pipe above the Floor Level.

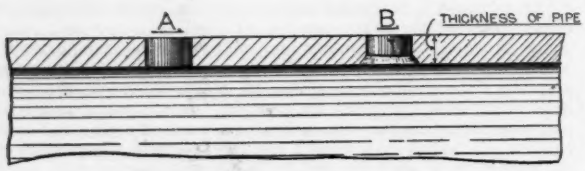


Fig. 2.—A Well and a Badly Made Hole in a Main.

a gauge on each of the outside holes, inserting the bag through the centre hole into the main, and then blowing the bag up. The gauge must be watched carefully while the bag is being blown up, to see that the pressure does not go down too low. When you are satisfied that the pressure is sufficient, you can proceed with the work. If it is a portion of the district you have any doubts about, it is advisable to try the main the day before you do the work, unless you can get the work done and the bags drawn by 11.30 a.m. It is also necessary, in testing this way, to take into consideration the levels of the district past where you are doing the work. If the pressure falls too low (which should not be less than 12-10ths) to do the work required, it will be necessary to fix a temporary rider. The size, of course, would have to be according to the work required of it; but a 1-inch tube, 12 feet long, will pass from 600 to 700 cubic feet per hour, with a loss of 4-10ths, which, presuming you have 20-10ths before you bag-off the main should get you over the difficulty, providing, of course, there are no very low levels past the position where you are severing the main. The temporary rider can either be made with wrought-iron tube bends, &c., or a length of armoured tube with a flange or union connection at each end. If it is necessary to fix a rider of larger size than 2 inches, the connection would be cheapest made with cast-iron pipes, bends, &c.

In all cases where a main has to be bagged-off for repairs, or any other purpose, I consider it is necessary to have a standing rule that the pressure must be tested with a gauge each side of a bag before commencing to finally fix the bags for whatever purpose they are for. There is then no possibility of a main being bagged-off where there is either a dead-end or a stoppage without knowing it. Where there are a large number of men, it is just possible a thing like this may occur; and as new methods of lighting often entail bye-passes being left on, by making sure you do not throw a length of main dead you possibly avoid an accident, through the bye-passes being put out and not turned off or relit when the main is charged up again. It is hardly necessary for one to point out that where a main is known to be a dead-end, a temporary rider should be fixed to keep up the necessary supply and avoid danger of an explosion in the length of main effected during the operations; also to save the waste in blowing clear of air the length thrown dead.

Another useful hint is the method of sealing a main for testing a length in sections, when you do not want to disturb a lot of paving or cut the main through in short sections, as shown in Diagram No. 3. This method I used very successfully in locating a small escape, which was travelling between the floating on top of the concrete and the wood blocks above it; there being a main on each side of the road—a 4-inch and an 8-inch. At any part of the road in question, gas could be traced for a distance of 80 yards; but as soon as the paving was taken up and the floating broken away, no trace of gas could be found below it. As it was an expensive matter to break up and reinstate a lot of wood paving, I decided to test the length of 8-inch first, as there were only four services off same. I had previously bagged-off this section to try if this would stop the leak; but owing to the main being an old one, and rusty, the bags allowed a little gas to pass, and by degrees charged up the main. Before fixing the bags as shown in the diagram, a gauge was placed in the main, and one set of bags was blown up; and then the other set. But still the gauge kept up. I then decided to fill up the space between the bags with water; fixing a clay lip round the holes to keep the water up above the level of the pipe. As soon as this was done, the gauge ran down at a fairly rapid rate. Another set of bags was then fixed in the main about a third of the length, at a place where the paving had been previously disturbed. On testing the longest section, it was proved sound. The short section was then divided in a place where the paving had been previously disturbed; and on the test being applied on a length of main about 12 yards, the gauge would not stand. This length was further reduced to 6 yards. I decided to strip this length; and on about 2 feet of the paving being taken up, an old ¾-inch disused service was found running off the main across the road. This had been cut off and capped-up at some previous time about half-way across the road. By degrees it had rusted through; and, being in the concrete, the gas was working its way up through the concrete and under the floating. From what I could see of the service in question, it was about 30 years old. This was cut off at the main, and the escape of gas stopped. My advice is, cut off at the main all services that are taken out of a building or to a disused lamp. Although it may mean taking up some wood or other kind of paving, it is the cheapest in the end—in fact, it is always the best plan to cut the gas out of all disused service-pipes that are likely to be lost sight of. For instance, if you have a 2-inch on a 4-inch branch in the main supplying a wrought-iron service, do not disconnect at the connector near the main and plug it up, but cut the joint out and fix a cast-iron plug in the neck of the branch; otherwise it is sure to cause trouble and expense at some future time.

Bagging-off Mains for Repairs, &c.

In bagging off mains for the smaller size pipes—say, up to and including 8 inches—one bag in each end of the severed main is sufficient, providing the bags are in a good condition. Pigs' bladders are very good for using up to 6 inches. Above 8 inches, it is advisable to use four bags fixed in the manner shown in the diagram; but in this instance not sealed with water. Should by any chance either of the bags next the gas let a little by, itc an be let out at the bag hole. This is much safer than using a single bag, as if by chance either of the first give way, one has the second to rely upon. This method also keeps the gas away from the men, enabling them to get on with their work

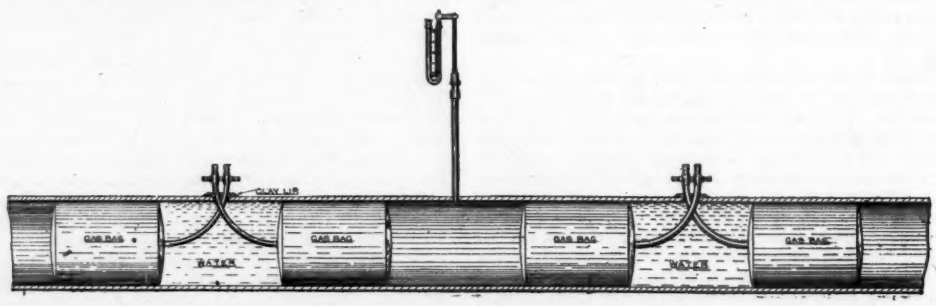


Fig 3.—Sealing a Main for Testing a Length in Sections.

quicker and better, and reduces the risk of any accident to a minimum. If repairing or altering a trunk main some distance from the works (the supply being given by another trunk main), as it is not wise to shut the valve at the station governor, and you are therefore liable to get holder pressure through leakage by the governor valve not seating firmly, it is advisable to fix even a third bag on the works side of the scene of operations. The third bag should be about 20 yards away from the bags where the cut-out is going to take place.

In alterations or repairs to large mains, if it is possible it is advisable to bag the main off about 20 yards on either side of the position where the work is being done. In bagging-off mains where more than two bags are being used, it is always best to fix the bags to the gas first; care being taken to get the bag in level. The reserve bags can be put in without the gas blowing to waste or inconvenience to the men. It is very necessary to mop out the main before putting in the bags; and care must be taken to keep the bag stick from under the bag during the process of blowing-up. When the work is completed, the reserve bags should be taken out, and before letting the gas go forward, the length of main which has been thrown dead must be blown clear of air. This can be done by slacking the bag on the side you have the heaviest pressure on first. This being a short length of main only, it will very soon be quite clear; and the complete replacing of air by gas can be detected by the smell. The bag hole should be clayed up, and the other bag slacked ready for drawing. Care should be taken, in cases of large bag holes, for the holes not to be kept open longer than absolutely necessary, as the unaccounted-for gas can soon be helped up when one comes to consider gas blowing out of a hole (say) 5 in. by 4 in.

It is always advisable, in cases of large repairs or alterations, to have an experienced inspector, or be there yourself, in addition to the ganger in charge of the work. In dealing with large mains, it is always advisable to have a strong set of jointers, as just by chance one or two may be affected a little in putting in the bags; and this would probably delay the work for an hour or so. The additional jointers could assist in the ordinary work if not required for jointing. It is always advisable to start the work as early in the morning as possible, and in the summer months to get the work well in hand before the public are about, particularly in a busy thoroughfare, especially if you have got a long length of main to blow out and another connection to make probably a

mile further ahead. Even with repairs, it is advisable to start the work as early as possible, so as to get it well in hand before dinner time—in fact, in cases of large work, I always like to see the bags out by dinner time. It is also advisable to draw the bags as soon as the joints have been chiselled round. The longer the bags are in the main, the worse it is for them, particularly if there is any solvent in the main; the cost of bags being an expensive item. Another very important point is not to put the bags in till quite ready for them; and once the main has been broken out, do not leave it under any circumstances until the new pipe is fixed and the joints run.

It is well to have a standing rule that wood plugs must be used when plugging-up the ends temporarily, and not stop the ends up with a boss of yarn, as this is liable to be left in—in fact, on two occasions when cutting out old mains I have found a yarn boss in the pipes. At the present time, no main cut out under my charge is allowed to be stopped temporarily with anything but a wood plug.

In searching for escapes, it is not always safe to use a lighted torch; and great care must be taken to ascertain that there is no trace of gas in any manhole of the sewer, telephone, or electric cable chamber, &c., before a lighted torch is applied. This can be ascertained by using a leakage indicator, of which there are several sorts on the market. In cases of an escape, it is always necessary to stick to it until it is found; and if it is in a paved street, care must be taken to avoid breaking up paving unnecessarily. It is better to spend a short time barring, and so enable the gas to get away before breaking down; one can very easily exceed the value of the time in breaking up paving in the wrong place. Of course, if the escape is a large and dangerous one, and the gas is getting into any premises, it is advisable to open out the particular spot at once, and draw the gas away from the place in question. On receiving notices of escapes, it is best to treat them all as dangerous, and then there is no fear of a dangerous one getting neglected, which may lead to serious accident if nothing worse. It is also necessary to use great care blowing-off a long length of large main—say, 1000 yards long. After the final test is made, and before there is any chance of gas getting into the main, have 2-inch blow-off pipes fixed every 250 yards. This can be done the day before the connections are made, fixing a valve on each one just under the ground level; at the end of the main, there should be two fixed—a 2-inch one near the bottom of the plug, and a 1-inch one will do off the top of the main. As soon as the connection is made, screw a length of tube, about 10 feet long, into each blow-off pipe, and open the valves on an indication from the man in charge of the bags, who must slack the bags slightly to charge the main.

It is necessary to keep the bag in position when it is slacked sufficient, to allow enough gas to pass to keep the main charged and maintain the pressure through the blow-off pipes, until the first section is clear. Then the bags can be drawn for good; there is no chance of any of the air getting back. It will be found that the leakage indicator which I have used several times for this purpose will show "all gas" on the top pipe much earlier than the bottom one. This, of course, is only natural; the gas being lighter than the air. It is not wise to trust to the indicator implicitly. It is, however, quite safe to try the gas with a light when the indicator registers "all gas," but not so with an open pipe. The safest way is to fix a stand-pipe with a small burner which has a gauze in. If one cannot be obtained, put a little cotton wool inside the burner, which will answer the same purpose. Even then you will find, if you stop the blow-off pipe a few minutes and try again, you have still got a percentage of air in the gas. If you have a water-gauge fixed on the main, as soon as the gas is let into the new pipe, an oscillation on the main (of probably from 4-10ths to 8-10ths) will be found. As the main gets clear of air, this oscillation ceases; and when a steady gauge on the whole length of main is obtained with all blow-off pipes shut off, it will be quite safe to light the gas in the same manner as before stated.

Maintaining suitable pressures in the lowest part of the district is another very important matter. It is not a very serious difficulty if dry meters only have to be dealt with, as the works pressure can be increased to suit the low points. But where there are all wet meters, it is a very different thing. The best plan is to take weekly pressures at the highest and lowest points of the district, and put the pressure at the works so as to insure that while the pressure at the highest point will not exceed that necessary to blow the water out of the meters, the pressure at the lowest which shall not be less than 14-10ths. Aim at nothing less than 15-10ths, as, owing to the large percentage of incandescent burners now in use, the old-fashioned pressure of 10-10ths is insufficient. In addition, it is well from time to time to obtain 24 hours' pressure records, at the highest and the lowest points throughout the year, particularly during the winter months, so as to give the necessary pressure at the time required. It also gives one an idea as to what extra pressure is required (say) from 6 a.m. till 9 a.m., and for cooking (say) from 11 a.m. to 1 p.m., which it is very essential to know. It also enables one to reduce pressure to the lowest required during the night (say) from 11 p.m. to 6 a.m. Where any large quantity of gas is required for power, it is essential to know all these points, and if you cannot get a satisfactory pressure at the lowest point, and are unable to increase the pressure at the works, it is then necessary to find a remedy. The best plan is to start from the root of the evil and have pressure pipes fixed in the main—one near the works, and another at the end of each different sizes of mains leading into the district. When taking these pressures, it is necessary to visit the place yourself, or send an experienced inspector to see that they are being taken correctly, as one wrong pressure may lead you on the wrong track. The pressures should be taken during the hours of heaviest consumption (say), in December from 3.30 p.m. till 10 p.m. By this means it will be discovered where the weakness lies. For example, take the following as an extreme case:

Commencement of	12-inch main	. . . . .	21-10th pressure, Level	513*
End of	12 "	" 830 yards long	22-10th	" "	550*
"	8 "	" 2600 "	" 17-10th	" "	632*
"	6 "	" 1000 "	" 14-10th	" "	643*
"	4 "	" 300 "	" 6½-10th	" "	578*

* Above O.D.

It will be seen by the foregoing that the greatest loss of pressure, taking altitude into account, per unit of length is in the 8-inch main, and the least loss in the 12-inch main. Even the latter is greater than is desirable; and to improve matters it is therefore necessary to enlarge the main throughout. It is necessary to carefully estimate the possible requirements of this portion of the district (say) for the next ten years; so that proper provision can be made not only for present needs but for the near future.

Another very important point is that all meters should be fixed perfectly level by the use of a spirit level; and to see that the meter is filled up to the water line, so as to ensure perfect registration, I am of the opinion, and always have been, that the mains and services are not responsible for the unaccounted-for gas they are blamed for.

Discussion.

Mr. R. J. Rogers (Birmingham) remarked that Mr. Ball had added to the "Transactions" of the Association a paper containing sound practical advice on distribution matters. As he stated, he had kept away from text-books, and had given the members the benefit of his own experience on the important subject of main and service laying. There was no doubt that a great deal of the unaccounted-for gas was lost in the operations of laying mains and services; and too much attention could not be paid to the necessity mentioned by the author of filling up the taps and rimers when drilling holes, &c. The practice of fixing valves on large services outside the building was a good one; and where this rule was adopted, some recognized position for the valve should always be insisted upon, such as Mr. Ball suggested—say, 6 inches from the kerb-line—so that in the event of the valve requiring to be turned off, in case of fire, &c., the precise position of the valve would be known, and no time be lost in searching for the valve-cover. The valves also should be periodically examined by the distribution department, to make sure they were in proper working order, as they might otherwise not be required to be turned off for some considerable time after they had been fixed, and would then often be found to be out of order. The system advocated by the author and described in fig. 1, for laying services above floor-level, was to be commended, and had several advantages over laying the service through the footings of the wall underground. A careless service-layer would often displace a whole brick 9 in. by 4½ in. when fixing the pipe through the wall underground, and never trouble to make the wall good. The ground was filled in, and troubles of various kinds might ensue from his carelessness. When the pipe was carried through the wall above the floor-level, the inspector was able to see that the hole in the wall was properly made good. Some builders had objected to the pipes being carried outside the wall, on the ground that they were unsightly; but this was not a serious argument, when one considered the number and sizes of the rain-water and other pipes fixed on the outside of buildings. It was advisable to have the special bend made of good tube either galvanized or that had been subjected to Barff's process (heating it to redness and exposing it to steam, so as to produce a coat of the so-called magnetic oxide of iron) to prevent the deposition of rust. Mr. Ball rightly pointed out the necessity of ascertaining that the supply to consumers was not being seriously interfered with when main-laying operations were in progress. He would like to ask him if he had experienced any great trouble by the accumulation of gas in telephone or electric cable junction-boxes. Serious accidents had been caused from this in various parts of the country; and it would be interesting to know if the author had experienced much trouble in Birmingham from this source. Now that electric trams were in almost general use in Birmingham, he would also like to know if any signs of electrolysis of the mains had been noticed. One could not help seeing, in reading Mr. Ball's paper, that he had got the question of unaccounted-for gas very much at heart. The water-line of consumers' meters had no doubt something to answer for in this connection; but when one considered that the majority of wet meters now in use were fitted with some form of compensating arrangement, maintaining the water at the proper level, and that large consumers' meters which had no such arrangement were carefully watched as regarded the water-line, he did not think there was much of the unaccounted-for gas to be attributed to the water-line of the meters. To his mind, the greater part of the unaccounted-for gas was lost in the distributory system, however much care was exercised in the distribution department. Coming to another point, there were instances, no doubt, where advantage could be derived from the adoption of high-pressure distribution; but, as Mr. Ball had remarked, the question of a high-pressure

installation should be carefully considered on the merits of each individual case. The paper contained much good, sound, practical advice, which the members would find useful both now and in times to come.

Mr. W. Lycett (Birmingham) scarcely thought that it was an ideal system to have the services on the outside of the building, especially when they had to run over a set-off or plinth. It had always been his aim not to put pipes outside if he could possibly help it. The rust must form owing to the moisture; and the pipe soon wanted renewing. He had always found that when corrosion began to take place, outside pipes gave a lot of trouble, especially in frosty weather. There was always more or less of a drip down the face of all buildings during damp and wet weather, which was very detrimental to iron piping. He thought, if outside pipes were used, it would be better if some means were adopted for keeping them well away from the wall, so as to get a paint-brush round them occasionally. This would be preferable to putting the service-pipe inside the room; but precautions must be taken. Then with regard to drilling mains for small services, had the author ever adopted the rose drill, which was preferable in his (Mr. Lycett's) opinion to the rimer? It made a perfect hole; and there was very little gas lost. When cutting out very large mains, in view of the danger from sparks, did he use all-steel hammers? As to the remarks about a lighted torch, he thought it was better not to use one at all in case of escapes. They could never see what was underneath the ground. There might be a big cavity somewhere, which would result in a serious explosion. He was glad Mr. Ball was coming round a good deal to high pressure. He himself felt quite sure that if one could get high pressure from the mains it would be a very good thing. It would be taken up strongly by consumers, and would be a weapon with which to fight electricity and other illuminants. As to the idea of the higher pressure increasing the leakage, he thought this was now exploded. With a high pressure, one could find out a leak very much more quickly than with a low pressure. Then, again, in laying out new work they would have a more severe test than now, which would result in the immediate revealing of porous pipes, bad joints, &c. Under these circumstances, he thought the leakage would not be increased. For lighting and heating purposes, it was better to have the pressure as high as possible.

Mr. W. E. Cadwallader (Birmingham) said the first thing he took any exception to in the paper was allowing for difference owing to fall in temperature. He had always considered this a negligible quantity; but looking more carefully into the matter, he found it was in consequence of working at lower pressures that the difference was so small. With the pressure of 30 inches named in the paper, of course, the difference would be very much greater. It was wise of Mr. Ball to use water instead of mercury for testing for soundness. He would like to know what the author thought of lead wool for jointing. Did he recommend that or the older method of using molten lead? He had heard very many people speak in favour of lead wool, and but little said against it. With regard to drilling for services, had the author any experience of the combined drill and tap? It seemed to be a useful tool, and one that would save much gas being wasted. He could not help thinking, in connection with the case Mr. Ball gave at the end of his paper with regard to the different sizes of main and the fall of pressure, that if he had the work himself, he would consider very carefully before he took the 12-inch main out for a few tenths; but in the other instances a larger sized main was certainly required. Mr. Ball mentioned the use of red and white lead cement for the threads and sockets of pipes. He (the speaker) could recommend this. He found numerous leakages when using red oxide paint; and red and white lead was far better than anything else he had tried. If service layers when screwing pipes together would use a good composition like this, there would be fewer escapes.

Mr. William Batt (Birmingham) referred to the idea of putting service-pipes on the outside of the wall, as shown in fig. 1, and remarked that they would be liable to sudden changes of temperature. He asked whether, in places subject to a large amount of naphthalene in the gas, such pipes would not be a constant source of trouble, through stoppages caused by naphthalene deposits. If the pipes were kept a little away from the wall, he said, it would be possible to get at the back to paint them regularly, and so prevent any corrosion. Why did the author prefer white yarn to tarred yarn?

Mr. F. J. Ward (Knowle) said he was mainly in agreement with Mr. Ball; but in one or two respects he slightly differed from him. One of the latter points was the exposing of the service-pipe outside. He himself never, unless he was positively forced to do so, had a service-pipe outside visible. Naphthalene was bound to accumulate, especially in frosty weather. Then, again, the author finished his service just above the floor-boards. This meant that the meter had to be there; and in some rooms it would be unsightly. Mr. Ball said, "In no case should a gas service-pipe be laid under a front room floor to a back cellar." How did he get there? He had got to get there somehow. He (Mr. Ward) did not hesitate to lay a service under the front room floor, provided the pipe was in a whole length with no sockets. If they were careful in this respect, a pipe would last in an ordinarily dry situation for nearly a hundred years. He was quite prepared to back this opinion; but if they could make it last for fifty years, they need not care what happened then. He had used lead wool, as well as ordinary molten lead. Lead wool had its advantages, but only to a limited degree. If they had a fractured main, they could, of course, put the matter right easily; but if he were running a long length of main, he would certainly use molten lead. He ventured to lay some fairly long lengths of mains with lead wool a couple of years ago; but he never had such sore shoulders in his life as at that time. It was necessary to put in ten times the power that was required with molten lead. Every bit had to be driven up as solid as possible; and, further, one could not use lead wool unless the mains were perfectly straight. Every socket must have an equal space all round to make a nice job. Though he would not use lead wool for long lengths of mains, for making fractures good, and so on, it was very useful. For drilling mains and services, he never used anything else now but the drill-rimer-tap. With this one could get an inch hole through easily in about 6 minutes—the thing then being completed. He would never go back to the old system after that. The job could be done with practically no loss of gas. He believed in having adequate pressures. In his own case, he had never altered the pressure for about eight years. It was the same day and night; and, although they would scarcely believe it, his unaccounted-for gas never exceeded 4 per cent. He believed at times the pressure was higher in the day than at night. If they had a high pressure in the daytime, they were going to do their work far better than with a low pressure, because small leakages that would escape notice by the fitter with low pressures in the day made themselves known when the pressure was higher. He believed that with a high pressure in the day they saved more than they lost. Anyway his unaccounted-for gas was very low. Mr. Ball told them to aim at giving nothing less than 15-10ths. Well, his own was 25-10ths. Leakages arose in a great measure from something that happened on the works. Holders would very often blow; and the sheets had a habit occasionally of leaking. He had a holder in use for some years which was a most serious business, until he had it all re-riveted and put right. That brought his leakage down about 1½ per cent. straight away. He thought they would find that if holders were looked to rather more than was often the case, it would bring the leakage down considerably. He did not believe there was the amount of leakage in the distribution system that it was usually charged with. In his opinion all mains should be laid with 2 feet of cover. This was the plan he had adopted at his own works; and it was a system which his predecessor to a certain extent adopted. That was to say, his Directors resolved shortly before he (Mr. Ward) took up his position to have all the mains relaid and lowered, so as to have 2 feet of covering on top. As his district was largely clay, they would have a good idea of what happened. If there was a leakage, it would not get out. It was well puddled round with clay.

The President (Mr. J. Hewett) remarked that though they had already had one paper on distribution, Mr. Ball had found plenty to say without repetition. The paper was to be commended, in that the author had selected a small portion of his work and dealt with it thoroughly. He was very modest in his opening paragraph; but, of course, he knew that the information would be most useful to many of them. With regard to fixing a valve on every service, this was certainly a great advantage. It was not necessary in the case of very small services; but every one of 2 inches and upwards should have a valve. A great deal of difference of opinion prevailed with respect to the correct position for this valve. Some people thought it should be against the building-line, because the traffic did not touch it and people did not walk upon it. But there were reasons why the valve could not be got so close to the building-line; and he thought the position given by Mr. Ball was the best place—namely, as close as possible to the kerb. With regard to the laying of services in troughs, of course, everyone accepted that; but he thought protection of services should be carried even farther than in the soil. Perhaps 10 per cent. of the services would show corrosion near the main tap. Whatever it was caused by, there was certainly a great deal of corrosion taking place inside the house; and some protection was no doubt necessary there. With reference to what had been said about the portion of the pipe shown by Mr. Ball outside the wall being affected by the atmosphere, it was, of course, galvanized, and it could be seen. As to naphthalene troubles, up to the present nothing had been experienced in that way. The thing was to prevent naphthalene getting on the district. It would give trouble if it collected there, without doubt. With reference to the interesting explanation that Mr. Ball had given them of tracing a leak in concrete, it was very surprising how easily one could be misled as to the location of a leak, not only in concrete, but even in good macadam roads. It might be necessary to go over a large area before the leak could be located. He thought the practice of pricking roads to ascertain leakage was certainly a very desirable one; and this work had been carried on most systematically in that district for a period of about two years now. Careful observations were made of the leaks found, and all particulars were being recorded. It had to be remembered that the roads that had been taken in hand up to the present were those containing the very oldest mains. Up to now it appeared that about 18 per cent. at the most of the unaccounted-for gas was due to leakage in the mains; and if this was corrected for the mileage of the newer mains, it meant that probably not more than from 10 to 15 per cent. of the unaccounted-for gas would be traceable to this source, or possibly ½ per cent. of the total gas made. He thought it was advisable that gangers' carts should be accompanied by an oxygen cylinder. Mr. Ward had spoken about working at the same pressure day and night. If it was useful for his district, no doubt it was all right; but in some places he would find it different if he kept on the evening pressure in the early

morning hours. When dealing with high-pressure distribution, Mr. Ball referred to using compressing plant for distributing gas over a district; and he (the President) was quite in agreement with him to this extent. At the present time, with the existing method of storing gas, they had available a pressure of perhaps 3 inches up to 12 inches; and as long as, with reasonable sized mains, a proper pressure could be maintained throughout the district, he quite agreed that there was no necessity to pay for pumping the gas. Gas could not be pumped for nothing; whereas the distribution department were not charged anything for the use of the pressure in the holders. He proposed a hearty vote of thanks to Mr. Ball for his admirable paper.

Mr. A. O. JONES (West Bromwich), in seconding the vote, remarked that there was not much left for him to say. He was glad the author mentioned that a higher pressure was necessary now-a-days than used to be the case. Now they had incandescent burners, and there were stoves, &c., in the daytime; and they could not, at the lowest, do with less than 15-10ths. Even 2 inches was not at all out of the way for ordinary day pressure. They were not all as lucky as Mr. Ward in the matter of pressure. At West Bromwich, though they had about 2 inches in the daytime, they were obliged to keep up to 4 or 5 inches at night. They had recently had all their new meters made to stand a pressure of 6 inches. Their pressures in West Bromwich were already pretty high; but they thought that in a few years' time they would have to go much higher so as to keep the distribution right. As to high-pressure mains, he agreed it was quite right that each case should stand upon its own merits.

Mr. BALL thanked the members for their kind vote, and then proceeded to reply to the remarks made by the various speakers. Mr. Rogers had, he said, referred to the necessity for systematically examining the valves on large services. This he took it for granted would be done. Anyone who had these valves fixed should see that they were periodically examined. If there were not a sufficient number to occupy a man's whole time, the round should be made at stated intervals—say, every six or twelve months. Particular care in this respect should be paid to places of amusement, and buildings of that character, so that in case of fire or other trouble they could be turned off instantly. As to the accumulation of gas in electric cable or telephone boxes, they had been very fortunate in Birmingham. He only knew of one instance of this kind in the last four or five years, and this was caused through the sinking of the ground in connection with some excavations. This promptly broke the telephone and cable conduits and also the gas-service on top; and so the gas passed from the service into the conduits. It was necessary to open up the conduits and keep a watchman at the chambers with the lids off till they found out where the gas was coming from. Eventually it was traced by the aid of a leak indicator. Of course, a light should not be used in a case like this. Up to the present time, he had not seen any traces of electrolysis in the Birmingham mains. With reference to Mr. Lycett's remark about outside services and plinths, &c., all that he could say was that the pipe must be bent to suit the plinth. Of course, the service-layer would not do this; but he could make a template, and it was a blacksmith's job to bend the pipe. This had been done in several cases; and it made a very neat job. Mr. Lycett also referred to keeping the pipe away from the wall. But this would look most unsightly; and it would also be a source of danger, as someone might amuse himself by seeing whether he could break it. The pipes should be kept close to the wall; and he thought as time went on they would get painted with the houses. As, however, there were men connected with the Gas Department up most roads once a week, they would notice any signs of the pipes decaying; and it would be their duty to report the matter to their chief, who would look into it. He himself had passed one particular service-pipe pretty well every week-day morning (and often on Sundays) during the past fifteen years; and he had not noticed that the pipe had deteriorated in the slightest degree. It had had several coats of paint. Judging from this experience, he did not think danger need be feared from the direction mentioned by Mr. Lycett. Even if there were an escape, it would come out into the road, and would be easily detected. As there were policemen in most of the streets during the night, the reports would be sent on to the proper quarter. They had in the past received complaints from the police that there was an escape in such-and-such a road. The constable went to the fire station and telephoned to the outdoor department of the gas undertaking; and a gang of men were at once dispatched. He thought himself that a pipe on a wall would last quite as long as one in the ground. In some cases the nature of the ground had to be considered, and wrought-iron pipes would not last for more than fifteen years. There was no doubt the character of the soil had a great deal to do with a pipe. Mr. Lycett mentioned the rose drill. This had been used very successfully; and the same remark applied to the riming drill referred to by Mr. Cadwallader. In fact, he thought the drill, followed on with the rimer, and then with the tap, providing the main was large enough, was best of all, because then one lost very little or no gas at all, and therefore it reduced the leakage. The question asked by Mr. Lycett, as to whether he used all-steel hammers, had rather set him thinking. It struck him that a hammer with an iron face would tend not to strike a spark so easily as a steel hammer. The hammers they used at the present time were those which were employed on all jobs; but great precaution was taken before striking a blow to place some water on the main that was going to be cut out—particularly with large mains. Throwing the water on the main, after well brushing it, reduced to a minimum the chance of a spark being struck. He had watched a large number of mains being broken out; and he only remembered seeing one spark—when by some means a side blow was struck on the pipe. When once the pipe was exposed, the water should be thrown upon it. He was still of the same opinion with regard to high pressure. He could not quite agree with Mr. Lycett, on account of the cost of compressing. Of course, Mr. Ward had a very fairly level area; but in the case of a town with different levels and wet meters, increasing the pressure unduly at the works would result in too great a pressure at the high levels. A good pressure on the mains was, however, better for lighting with incandescent burners and also for cookers. As to Mr. Cadwallader's remarks about lead wool, he would be candid, and say at once that he did not like it, and did not think he ever would like it for ordinary cast-iron mains. One wanted to stand over a man while he did the work, to see that he started hammering at the beginning and hammered on to the end. It would be necessary to have an inspector on every job, in order to make sure that the work was well done; and they could not afford to keep a man looking on the whole time. He entirely agreed with Mr. Ward as to his sore shoulders, because one had to hammer hard all the time, and it therefore required a lot of labour. With reference to lead wool for Mannesmann tubes, however, although he had not himself used any, he had seen some employed; and no doubt it was very useful for the purpose. But even then the jointer had to be one who could be thoroughly relied upon for doing his job in a systematic manner, and working at it from the time that the first strand was put in. Mr. Batt asked the reason why he preferred white yarn. Well, he found that tarred yarn was liable to be pulled out of the socket again. He remembered making some joints with tarred yarn, and he found this difficulty; so he obtained permission to use white yarn, with which it was possible to yarn the joint more solid and better. Mr. Ward had alluded to the back-cellar, and said, "You have got to get there." But they had not to get there. The meters should be brought out to the front line of the building, and the service shortened as much as possible, so as to keep all unregistered gas out of the house. Of course, 25-10ths was a very good working pressure; but there was not much difficulty in regulating pressures in the Knowle district, because the levels did not vary much. He did not suppose that from the gas-works to the end of Mr. Ward's district the rise in level would be much more than 50 feet. As to naphthalene, he had almost forgotten all about it; and he hoped he would never be troubled with it any more. But, in any case, he did not think the outside pipes would make any difference with regard to the settlement of naphthalene. He did not believe it would settle in the bend. It would probably form and deposit at the main-tap or else at the union close to the meter. He had not heard of naphthalene in any of these bends since they had been used; but he trusted that naphthalene in the case of most gas-works throughout the country was a thing of the past.

Mr. O'Connor's First Lecture.

Mr. Henry O'Connor, Assoc.M.Inst.C.E., F.R.S.E., gave yesterday week the first of the series of lectures on "Gas Manufacture and Lighting," which he is to deliver on four successive Monday evenings, before the Royal Scottish Society of Arts, Edinburgh. The lecture opened by a historical notice of the various forms of lights from the brand taken from the fire to wood candle holders, puir-men, bouets cruisies of shells, stone, iron, and other metals to the Italian oil-lamps and candles and the moulds for making them. Murdoch's first attempt at gas lighting in Cornwall, and some facts upon the early days of gas lighting were described. Coal (the foundation of gas lighting) was then referred to from the time of the primæval forests through the various stages of peat, lignite, earthy coal, cannel, gas coal, steam coal, and anthracite—the oldest coal of all. The fossils found in coal, the basin-like formation, the quantity of coal still available in known coalfields, the increasing rate of consumption, the limit of depth for mines (owing to the heat), the early days of mining (when women were employed at the same duties as the men), and the power of coal for various purposes, were all touched upon. The products of the coal were the next subject; and the manufacture of sulphate of ammonia from gas liquor, and the plant required, were noticed. The tar derivatives, the recovery of which has proved such a large industry on the Continent, were fully gone into, and samples of each were shown on the lecture table. Some experiments in dyeing with aniline dyes were shown; and the many uses of the tar products as medicines were referred to. The lecture was illustrated by a large number of slides, showing every stage of the operations referred to.

Heating in Stored Coal.—The officials of the Coal Department of the Arthur D. Little Laboratory, Boston, have found instances where a small coal pile cooled down after being as hot as 165° Fahr. This is probably a rare occurrence, as the temperature generally increases rapidly as the coal heats above 150°, and when a temperature of 212° is reached the coal should be moved, or else some steps should be taken to cool it in order to prevent fire breaking out in the heap.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to the Meter-Works of Messrs. Parkinson and W. & B. Cowan.

The members of the Scottish Junior Gas Association, to the number of fifty, paid a visit on Saturday afternoon to the meter-works of Messrs. Parkinson and W. & B. Cowan, Limited, in Buccleuch Street, Edinburgh. They were received by Mr. J. Hepworth, the Managing-Director, Mr. A. Stein, the Works Manager, and Mr. C. Campbell, the Cashier.

Mr. HEPWORTH, on behalf of his co-Directors and himself, expressed the pleasure they had in having the members of the Association there, and the hope that, at the close of their visit, they would not find that it had been an afternoon wasted. The Company had seven works in this country and abroad, and these were their oldest works. The fact was that they had always been wanting to get a larger area; but the difficulty in doing this had been great, and the members would find that the works were very much congested. The latest works which had been built were also theirs. They had been erected in London, and were opened a few weeks ago. He wished the visitors to particularly note the leather department of the works, of which the Company made a specialty. They had, for the present day, what might be called a show-room, in which would be seen a collection of articles all of the Company's manufacture.

The party then, under the guidance of Mr. Hepworth, Mr. Stein, Mr. Campbell, and the several foremen, passed into the works, which had been kept going for the benefit of the visitors. The business of Messrs. W. & B. Cowan was started at Crossmyloof, in Glasgow, and was transferred to Edinburgh in 1825. There was shown the original building which the firm occupied—a two-storey stone structure, 40 ft. by 24 ft.—now hemmed in on all sides by buildings, three storeys in height, which cover a space of three-quarters of an acre. The walk was through the white metal casting-room; the brass casting-shop; the drilling and machine shop; the proving-room; the diaphragm-tying shop; the tin-plate meter-shop; the brass-store, in which, it was stated, there were 5700 pieces of different pattern and size in stock; the brass finishers' shop; the leather cutting and examining shop; the drum-making shop; and the show-room. Numbers of swiftly-working and intricate machines and interesting processes were seen at work; the machines being, to a large extent, combination tools, doing more than one operation at a time. In the show-room were seen a collection of dry meters, in connection with which it was explained that, in response to an inquiry, they had been tested to ascertain whether they were accurate at high pressure; and it had been found that they stood a pressure of 45 inches. There was also a retort-house governor, of 8-inch size, with counterbalance. There were models of governors; Cowan's pressure changer; an improved service cleanser, of light weight; sets of Cowan gauges, including the new multiple gauge, shown for the first time, in which one glass does the duty of six; pocket pressure-gauges; wind-proof and storm-proof lanterns; anti-vibrators, &c. Power for all the work carried on is derived from a National gas-engine.

At the conclusion of the inspection, the visitors assembled in the office.

The PRESIDENT (Mr. A. Morton Fyffe, of Dundee), on behalf of the Association, said how much they appreciated the great kindness of the Company in having them there. They would all agree with him that the visit had been one of exceptional interest. It was a matter of mutual satisfaction that there had been such a large attendance. As he stated at their meeting in Dundee in January, the session in progress was, without doubt, the most successful one the members of the Eastern District division had yet seen; and the success which had marked the session was still evident in their meeting that day. He was sure they had all cause to be grateful to Messrs. Parkinson and Cowan for their kindness in entertaining them, and for the trouble they had taken in having their works in operation during the visit. This privilege they greatly appreciated, because it assisted them in forming an idea as to the actual operations going on in the manufacture of meters, governors, and other gas apparatus. While Mr. Hepworth had stated that the Buccleuch Street works were the least modern of the Company's establishments, from what the visitors had seen they must conclude that, if this were so, the other works must have attained an exceptionally high level of perfection. He proposed a vote of thanks to the Company, and a special vote to the gentlemen who had so kindly shown the party round.

Mr. HEPWORTH said the Directors felt themselves honoured by the visit of the Association, and would be pleased to see them again. He himself had an interest, not only in the manufacture of meters, but also in the gas manager, having been one himself for many years. It was a great pleasure to him to think that the advantages available at the present time were so much more than they were in his young days; for not only were there no Associations then, or only a very few, but no facilities existed for the interchange of thought, or for inquiry into what others were doing in their works. Nowadays, however, the whole of this was altered. Everyone there that afternoon could, if he chose to give himself but slight trouble, get to know what was going on in any gas undertaking; and the facilities they had for pursuing their studies, and for aiding the progress of those whom they served, were such as did not exist twenty or thirty years ago. He was exceedingly glad to know that the Association was flourishing; and, judging from the impression made upon him by the visit, he thought its success was likely to continue.

The Edinburgh Gas and Meter Testing Arrangements.

On leaving the Buccleuch Street works, the visitors were conveyed in a motor omnibus to the City Chambers, where they had the privilege of inspecting the arrangements made for testing gas-meters and also the gas supplied to Edinburgh. The testing department occupies a handsome set of apartments which form a suite by themselves, and which are kept at a uniform temperature by means of steam radiators. There is a workshop, in which necessary repairs are made, and in which also are kept the records of the work done by the department since its institution in 1861. These show that the first meter tested was one made by Messrs. W. & B. Cowan, and that it was registered as "nett." The total number of meters which had passed through the station up to the 15th of May last was 2,253,256; and the total fees collected had been £66,464. In the room devoted to the work of testing, there are three standard test holders of 1, 5, and 10 cubic feet capacity respectively. These instruments are the property of the Government, and the Corporation are the custodians of them. The calculations for their construction were worked out by Professor Airey, of Edinburgh, a former Astronomer-Royal for Scotland. There is also a 100-light meter, which is portable, and is taken from place to place, as required, for the testing of station meters. A standard self-correcting barometer, by Mr. A. H. Baird, of Edinburgh, is here provided; and there is also apparatus for testing appliances for the automatic lighting and extinguishing of public lamps, of which two were under test at the time of the visit—the one the appliance of Messrs. Alder and Mackay, of Edinburgh, and the other the German appliance known by the name of "Bamag"—both of which work by an increase of pressure. In one corner of the station stands a 20-light meter; and there are gauges and other fittings for the testing of high-pressure gas-supplying apparatus. In a room by itself is the 60-inch Letheby-Bunsen standard photometer, which has been fitted up for testing the illuminating power of the gas; also for research work, and for determining the light-giving efficiency of burners supplied to the Corporation for their different departments where gas is consumed. This apparatus has been supplied by Messrs. Alexander Wright and Co., Limited. It has been stamped by the Standards Department of the Board of Trade. Besides the tests for ordinary illuminating powers, the photometer is adaptable for use with a Simmance-Abady "Flicker" attachment, for the testing of higher standards.

The visitors were received by Mr. W. Gordon, the Inspector of Gas-Meters, who explained the apparatus. With regard to the standard test holders, he stated that Messrs. Thomas Glover and Co., Limited, supervised the making of them; they were placed in position by Messrs. Bryan Donkin and Co.; and they were accepted by Mr. Ferrier, the then Inspector of Meters. The largest one weighed 21 cwt.; the next in size, 12½ cwt.; and the smallest one, 6½ cwt.

Hospitality of Messrs. Parkinson and Cowan.

On leaving the City Chambers, the members were driven to the rooms of Messrs. Ferguson and Forrester, Limited, in Princes Street, where they were entertained at tea by Messrs. Parkinson and W. & B. Cowan. Mr. Hepworth was in the chair. After the repast, Mr. H. Rule, the Vice-President, proposed votes of thanks to Messrs. Parkinson and Cowan for their hospitality, and to Mr. Gordon for his kindness in showing the members the testing-station. The votes were heartily accorded.

WESTERN DISTRICT.

Monthly Meeting in Glasgow.

The members of the Western District met on Saturday in the evening in the Technical College, Glasgow—Mr. A. H. WHITELAW presiding over an attendance of about forty.

The PRESIDENT stated that the Council had received a letter from Mr. George Braidwood, the Hon. Secretary and Treasurer, tendering his resignation. Mr. Braidwood said he had now held the post for four years, and he considered it fair the honours should go round. He added that the gentleman to be appointed would have his assistance till the end of the session. The Council left it to the meeting to say whether they would appoint a permanent or only an interim Secretary; but they were in favour of the latter.

The meeting, by a very large majority, approved of the Council's suggestion; and the appointment was unanimously conferred upon Mr. R. A. Campbell, of Glasgow, who said he took the position on the distinct understanding that it was only to be till the end of the session.

The PRESIDENT introduced Mr. G. H. M'Cowat, of Glasgow, who read a paper on "Distribution of Gas: Main Laying." The manuscript did not reach us in time to allow of its preparation for publication to-day; and it will therefore have to be deferred till next week, with a report of the discussion upon it.

A vote of thanks was accorded to the author, who expressed his appreciation of the compliment.

REGISTER OF PATENTS.

Vaporizers for Gas-Producers.

RIES, H., of Munich, Germany.

No. 966; Jan. 15, 1908.

This invention relates to vaporizers wherein the steam required for the production of gas is generated by the combined radiated heat from the producer grate and the conducted heat from the products of combustion from the furnace utilizing the producer gas. In apparatus of this type, it is usual to provide a water-tank disposed below the producer grate, having tubular extensions terminating in a thin plate on which the hot ashes from the grate fall and in which perforations are formed for the outlet of steam. But here the water-vessel comprises a tank provided with downwardly extending chambers or tubes which, says the patentee, besides increasing the heating surface of the water-vessel as has hitherto been done, serve as supports for the water-vessel proper from which they extend.

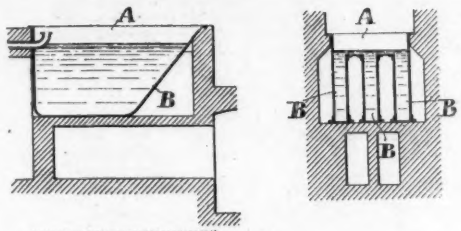


Fig. 1.

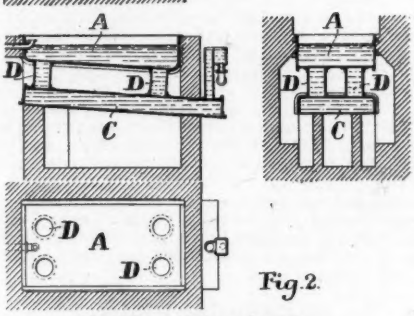


Fig. 2.

Ries's Gas-Producer Vaporizers.

The downwardly extending water-chambers (see fig. 1) may be of rectangular cross section having their bases resting on the masonry or other setting of the furnace, or a rectangular foundation tank (fig. 2) may be connected by hollow supporting pillars with the tank proper; the construction being preferably such that the products of combustion not only come into contact with the hollow supporting pillars, but also with the upper and under surfaces of the foundation tank. In both instances, the steam is led to the producer; the desired water-level being maintained in some known manner.

In fig. 1, the water trough or pan A is provided with downwardly extending chambers B, which not only increase the heating surface of the pan as a whole, but also serve to support the pan; the products of combustion from the furnace coming in contact with their lateral walls. In this construction, the supporting chambers are of rectangular cross section. In fig. 2, the water-vessel proper A is connected by tubular pillars D to a rectangular tank C, which rests on the setting of the furnace and so forms a foundation for the supporting members D.

This latter construction is said to be preferable to that shown in fig. 1, "since not only do the products of combustion come in contact with the lateral walls of the hollow supporting pillars, but also with the upper and under surfaces of the foundation tank."

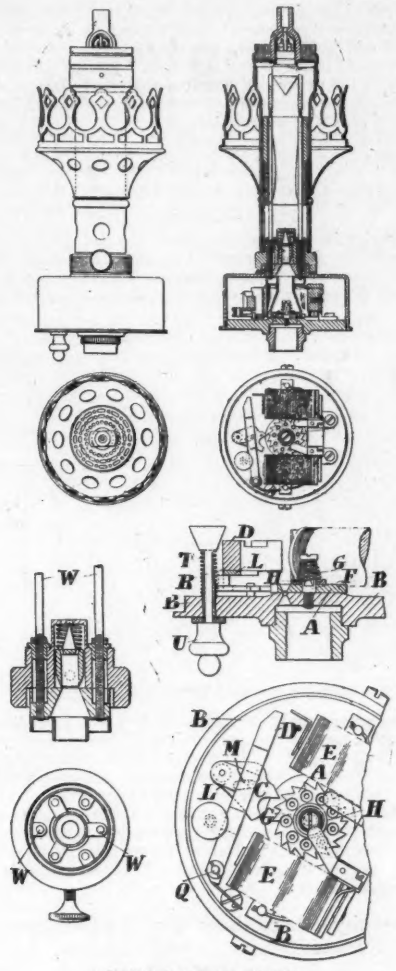
Controlling, Igniting, and Extinguishing Gas from a Distance.

DOWN, H. L., and TELEPHOS LIMITED, of Cannon Street, E.C.

No. 1453; Jan. 21, 1908.

This invention relates to improvements in gas-burners to which are applied electrical devices whereby the supply of gas to the burner is controlled, and by which the gas is ignited or extinguished, from a distance by the actuation of any convenient form of electrical switch, with the object of overcoming "certain difficulties in the construction and operation of such burners and the parts in connection therewith."

In the apparatus illustrated, the passage of the gas to the burner is controlled by a toothed wheel-valve A rotating upon the base-plate B. A step-by-step rotatary movement is imparted to the valve by a pawl C mounted upon the armature D of an electro-magnet E. In order to ensure a gas-tight joint between the valve and its seat, and also to ensure a positive step-by-step movement of the valve for each backward and forward movement of the armature without any back-lash or recoil, the valve is mounted upon a round stem F screwed into the valve seat and having an upwardly projecting extension G. On this



A Modified Telephos Lighter.

extension is threaded a recessed washer H, with a hole corresponding to the shape of the extension; and above this is a fine helical spring. An even pressure of the valve upon its seat can be ensured, and any tendency to back-lash due to the recoil or torsional action of the spring is resisted by the washer, which cannot turn because of its D-shaped spindle. The pawl C, which is pin-jointed to an arm L on the armature, has a slot M, which engages with a fixed pin on the base-plate. The slot is so shaped that, when the armature is attracted by the electro-magnets and the pawl approaches the teeth of the valve A so as to engage with them, the fixing pin acting upon the side of the slot turns the pawl upon its centre and causes the valve to make a partial revolution—a projection on the opposite side of the pawl acting as a stop or retaining pawl in engagement with another tooth of the valve-wheel A. The armature is returned into its normal position by means of a spring mounted upon the pin Q, which the armature turns.

R is a pin passing through the base-plate and having a bevelled head which is normally just free of the armature, as shown. T is a spring which retains this pin in the position shown; but should the armature fail to work, the gas may be turned on and off by pulling the knob U against the resistance of the spring, thereby causing the armature to operate independently of the electric current—thus forming an emergency device.

The jet of gas must pass from the gas-nozzle in a direct and uninterrupted stream to the mixing point in the bunsen tube, and in order to avoid the necessity of bending the conductor rods W, which convey the current from the electro-magnets to the electrical igniter holder, the bunsen tube is made with parallel sides as shown, and fitting closely therein is a reducing or choking tube, of porcelain or other insulating material, with two holes or recesses in the wall, through which, or in which, are straight conductor rods arranged to diverge slightly towards their upper ends so as to retain the reducing or choking tube in the desired position by friction. At the upper ends of the conductor rods is attached the igniter holder by a telescopic arrangement (somewhat similar to that described in patent No. 26,694 of 1902) which consists of two short tubes which slide over, and form removable continuations of, the conductor rods. The upper ends of the rods may be reduced in diameter where they enter the tubes of the igniter holder; and between the bottom of the tubes and the shoulder which is formed by the reduction in diameter of the conductor rods are placed helical springs, which serve to keep the washer on the igniter holder against the lower end of the downwardly projecting flange of the burner-head.

Gas-Engines.

BURNETT, A., of Pheonix, British Columbia.

No. 2822; Feb. 7, 1908.

These improvements in gas-engines of the double-acting type have for their object to provide means for insuring the admission of the

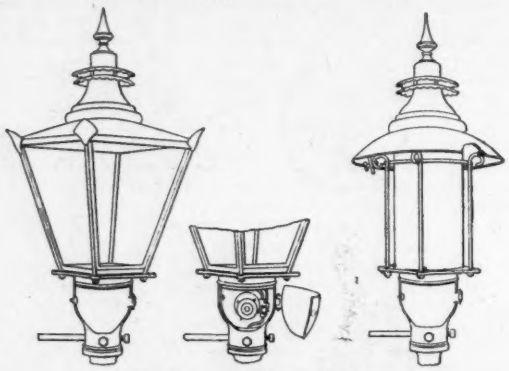
initial charge of gas and air into one set of cylinders at one time, consisting essentially of peripheral cams formed on the wrist-plate of the engine and end guiding-ribs, also forming part of the wrist-plate, pivoted arms and laterally movable rollers journalled in the arms and co-acting with the peripheral cams of the wrist-plate, and a link and lever connection between the free ends of the arms and the float-rings of the admission valve mechanisms.

Gas-Lanterns.

GUNNING, J., of Bristol.

No. 2960; Feb. 10, 1908.

This invention is designed to protect any automatic controller that may be used with a street-lamp. Instead of the usual frogs carrying the lantern and secured to the standard, it is proposed to substitute a closed casing provided with a door to make the controller accessible.



Gunning's Lamp Controller Protector.

In the first arrangement shown, the lantern is of the ordinary pattern, supported on a box or casing containing the automatic controlling mechanism, and secured to the lamp-post by forming the lower part of it to slip over the top of the lamp-standard. Set-screws (one of which may be the ladder rest) clamp the casing in position.

In the second construction the ordinary lantern is dispensed with, the support for the lamp-crown being preferably hinged to one side of its support and provided with a catch at the opposite side. A glass chimney is fitted over the top plate of the box, and securely held in position by the closed crown.

Automatically Controlling the Temperature of Gas-Heated Ovens, Water Boilers, &c.

DAVIS, H. N., of Luton.

No. 6226; March 20, 1908.

To achieve the patentee's object, pneumatic pressure, the intensity of which is proportional to the temperature of the apparatus, is caused to operate a valve controlling the gas supply to the burners. When the valve is applied to a water-boiler, an expansion tube is inserted into the water space, and connected by a pressure tube to a valve-box on the main gas-supply pipe to the burners.

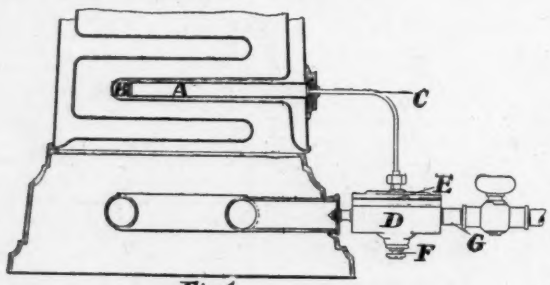


Fig. 1.

Fig. 2.

Davis's Automatic Water Heater Controller.

In operation, the apparatus (as shown) works as follows: As the temperature of the water in the boiler or air in the radiator or cooking-oven increases, the air or gas in the expansion tube will also become heated and expand—thus causing an increase of pressure to be felt, not only in the expansion tube, but also in the pressure-pipe and in the pressure-space above the diaphragm in the valve-box. When the pressure in the valve-box has been raised sufficiently, the diaphragm is forced downwards towards the gas-supply pipe, and thus reduces the supply of gas to the burner to such a degree that only sufficient gas passes to maintain the required degree of temperature. If hot water is drawn from the boiler, or air allowed to escape from the radiator or oven, and cold enters to take its place, the reduction in temperature causes the pressure in the expansion chamber and valve-box to be reduced, so that the diaphragm returns (or partly so) to its normal position, and thus opens the supply of gas to the burner. By adjusting the position of the gas-supply tube by a regulating screw relative to the normal position of the diaphragm, the temperature at which the apparatus is required to be kept may be regulated at will.

Fig. 1 shows the valve applied to a water-boiler, with the expansion tube A inserted in the water space B; a pressure tube C; a valve D, with diaphragm E; a regulating screw F; and the gas supply G. Fig. 2 shows the regulator valve in plan and sectional end elevation, with tube H for a bye-pass.

Gas-Burners.

HARRIS, A. E., of Finsbury Pavement, E.C.

No. 11,071; May 21, 1908.

This invention relates to atmospheric gas-burners especially applicable for use in water-heating apparatus, cooking appliances, and the like. The burner comprises a series of superposed pipes or sections (connected to a common supply passage or connected to each other by junction tubes) provided internally with baffle-plates, which break up the gas currents "so as to cause a thorough mixing of the gas and air, and also to ensure that the proper supply of gas shall reach each burner hole or nozzle."

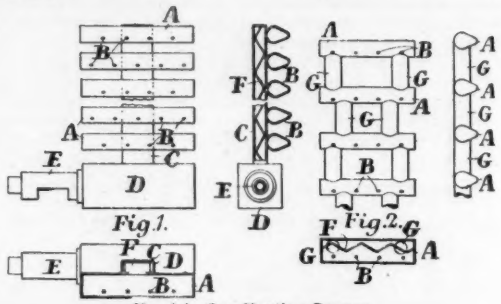


Fig. 1. Fig. 2.

Harris's Gas-Heating Burner.

Fig. 1 is an elevation of a burner having a series of superposed pipes connected to a common supply pipe; also a vertical and a horizontal section. Fig. 2 shows the arrangement where the burner-tubes are connected together.

A are the burner-tubes (somewhat pear or oval shape), and B are the burner openings formed preferably on the underside. The tubes are all connected to a common supply pipe C (of rectangular cross section) connected with the chamber D in which the mixture of gas and air is supplied in the usual manner through the mixer E. F is a baffle-plate inserted in the tube C. It is of slightly less width than the tube, and, being zig-zag or sinuous, when inserted in the tube the angles or corrugations come into contact with opposite walls of the chamber. The gas leaving the mixing-chamber D flows to the apertures (at which it burns) around the baffle-plates, and through the corrugations, "so that a thorough mixing and uniform distribution will take place."

In the arrangement shown in fig. 2, the several burner-tubes A are directly connected by junction tubes G placed out of alignment, so that the gas which enters them in connection with the lower burner-tubes does not pass straight upwards but is caused to travel in a zig-zag or sinuous course.

Gas-Engine Igniter.

BROWN, D. S., and STINZING, F. C., of Manhattan, N.Y., U.S.A.

No. 18,176; Aug. 29, 1908. Date claimed under International Convention, Aug. 30, 1907.

This invention relates to an igniter for gas-engines, in which flint and steel, or their equivalents, are employed for creating the igniting spark. The arrangement comprises a pivoted flint holder with a flint in it, a pivoted striker, a spring tending to draw the flint holder so as to position the flint in the path of the striker, and a cam-actuated operating rod adapted during its movement in one direction to engage positively with the flint holder to move it against the tension of its spring, and thus carry the flint out of the path of the striker. A spring encircles the rod, and is adapted to yieldingly engage and move the striker during the operation; the rod in its reverse travel being adapted to engage the striker positively, and so cause the latter to contact forcibly with the flint, which has been permitted, by this movement of the rod, to occupy a position in the path of the striker.

APPLICATIONS FOR LETTERS PATENT.

2343-4.—FISCHER, H., "Mantles." Feb. 1.
2392.—TURNER, J. E., "Flexible gas-tubing." Feb. 1.
2395.—COWPER-COLES, S. O., "Lamps or lanterns." Feb. 1.
2396.—COWPER-COLES, S. O., "Reflecting surfaces." Feb. 1.
2445.—MASON, F., "Incandescent burners." Feb. 2.
2468.—GRICE, A. G., "Gas-engines." Feb. 2.
2495.—CHAPMAN, W. B., "Gas-producers." Feb. 2.
2499.—SIMONE, M. G. DE, and LUCA, A. DE, "Universal joints." Feb. 2.
2620.—KEY, W., "Production of gas." Feb. 3.
2630.—SPARKS, E., "Gas-cocks." Feb. 3.
2651.—HELPS, G., "Gas lamps and burners." Feb. 4.
2655.—LEA, J. W., and PERRINS, J. H., "Anti-vibrator fittings." Feb. 4.
2657.—ELLIS, J. W., and ARNOLD, H. W., "Conveyance through pipes of gas, water, or other liquids." Feb. 4.
2758.—GARDNER, F., and CALLOW, W., "Double security cash-box for automatic meters." Feb. 4.
2781.—MELLOR, T. K., "Supporting mantles." Feb. 5.
2804.—GARDNER, J. S., "Automatic cut-off for sealing rising gas-mains in cases of earthquakes, subsidences, or changes of level." Feb. 5.
2813.—WILLIAMS, P. E., "Treatment of burnt residues obtained by the burning of the spent oxide of gas-works." Feb. 5.
2912.—GARDNER, J. S., "Automatic cut-off for sealing gas-mains in cases of earthquakes, subsidences, or changes of level." Feb. 6.
2919.—KÜNKLER, A., "Gas heating and cooking stove." Feb. 6.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Auction Clauses in Gas Acts.

SIR,—If I may be permitted to return (for the last time, I hope) in your columns to the subject of the Model Auction Clauses, it is to express the hope that in the approaching session of Parliament the clauses may attain perfection and finality. But at present an imperfection exists which requires amendment.

The first four clauses run thus:

1.—All shares or stock to be created by the company under the powers of this Act shall be issued in accordance with the provisions of this section.

2.—All shares or stock so to be issued shall be offered for sale by public auction or tender, in such manner, at such times, and subject to such conditions of sale as the company shall from time to time determine. Provided as follows:—

(*a*) Notice of the intended sale shall be given in writing to the clerk to each urban or rural district council having jurisdiction over any part of the limits of supply and to the Secretary of the London Stock Exchange at least 28 days before the day of auction or the last day for the reception of tenders, as the case may be, and shall also be duly advertised once in each of two consecutive weeks in one or more local newspapers circulating within the limits of supply.

(*b*) A reserve price shall be fixed, and notice thereof shall be sent by the company in a sealed letter to be received by the Board of Trade not less than 24 hours before, but not to be opened till after, the day of auction or last day for the receipt of tenders, as the case may be.

(*c*) No lot offered for sale shall comprise shares or stock of greater nominal value than £100.

(*d*) In the case of a sale by tender, no preference shall be given to one of two or more persons tendering the same sum. In the case of a sale by auction, a bid shall not be recognized unless it is in advance of the last preceding bid.

(*e*) It shall be one of the conditions of sale that the total sum payable by the purchaser shall be paid to the company within three months after the date of the auction or of the acceptance of the tender, as the case may be.

3.—Any shares or stock which have been so offered for sale and are not sold may be offered at the reserve price to the holders of ordinary shares or stock of the company in manner provided by the Companies Clauses Act, 1863, and to the employees of the company and to the consumers of gas supplied by the company, in such proportions as the company may think fit, or to one or more of these classes of persons only.

4.—Any shares or stock which have been offered in accordance with subsection 3, and are not sold, shall be again offered for sale by public auction or by tender, in accordance with the provisions of this section; and any such shares or stock then remaining unsold may be otherwise disposed of, at such price and in such manner as the directors may determine, for the purpose of realizing the best price obtainable.

It will be observed that clause 3 empowers (but does not direct) a company to deal in a certain manner with any shares or stock which remain unsold after having been offered for sale under clause 2. And clause 4 directs that any shares or stock which remain unsold after having been offered for sale under clause 3 shall be disposed of in a certain manner.

But if a company elects not to exercise its powers under clause 3, there is no direction how in that case the shares or stock which remain unsold after having been offered for sale under clause 2 shall be disposed of.

The substitution of the words "subsections 2 or 3" in lieu of the words "subsection 3" in subsection 4, or something to that effect, appears to be required.

It would perhaps be expecting too much if a suggestion were made that the words in subsection 4 after "are not sold" down to "remaining unsold" might with advantage be expunged. But all that these words effect is delay; and delay means waste of money.

Why should the innocent consumer, who after all has in a measure a partnership interest in the undertaking, be saddled with the expense of vastly ingenious, but wholly unbusinesslike, obstacles which only impede the directors in reaching the goal which they must arrive at, sooner or later—viz., the emission of new shares or stock at the best price obtainable in the market?

Commercial Gas Company, Stepney, E., Feb. 12, 1909. H. D. ELLIS.

Railway Demurrage and Siding Rent.

SIR,—The Railway Companies' new regulations relative to the above have, indeed, aroused considerable interest, particularly in the coal and iron trades, which are most affected; but surely the correspondent in your last issue is taking much too serious a view of the situation so far as the gas industry is concerned. He states that the new system of demurrage charges has caused "grave concern to responsible officials of gas-works," and that the "gas industry of Scotland is more seriously affected than any other industry." Your correspondent, like some others I know, may have some local reason for admitting funk; but I can find no proof of either view being in complete agreement with actual fact. Why should the simple imposition of a charge—which on all hands is admitted to be reasonable—for the misuse of Railway Companies' waggons cause grave concern in some quarters, imperil the coal supply of the gas industry whose seasonable demands are so readily ascertained, increase the financial charges, make it necessary to appeal to the Board of Trade for protection, and become the vehicle for a disingenuous attack on the North British Association of Gas Managers?

The question at issue appears to be of vital interest only to those in charge of large gas-works possessing sidings and coal-handling machinery. According to some people, one would think the machinery was only designed to work if a regular supply of coal by waggon was obtained. But for what do we require (as a stand-by) six weeks' stock of coal, if not to help us to overcome any irregularity in supplies whether caused by railway delays, pit stoppages, stress of weather, holidays, or any other cause whatever? Apparently a few of the larger works, and certainly all the smaller ones, can arrange and manipulate their traffic with more business-like dispatch, having regard to their respect for other people's property, than can the largest works. In any case, large or small works can only be affected by the new regulations to the extent to which they have, in the past, been dependent upon the Railway Companies' waggons as a free agency for the economical storage of coal and the difference of taking out of stock and putting it back again as the circumstances of supply and demand necessitate. Probably the fear of having to be fair to the Railway Companies, and pay them for the privilege of obtaining ample waggon storage, explains the necessity (?) of those in charge of some large works petitioning the Board of Trade for protection. One can be in sympathy with the parties in their endeavour to keep themselves and to obtain relief of some sort, however little, if they think it is otherwise unobtainable, without admitting that the action of parties was proof that the question was of such vital importace to the gas engineering profession as to call for the interference of the North British Association of Gas Managers! I have studied the question very closely; and after eliminating the sophistry and philosophism of some writers, have formed the opinion that the gas industry need be least of all affected by the new charges, and submit that, if stocks are well maintained and the daily requirements ordered, regulated, and taken delivery of with a due and proper sense of proportion, a very even balance may be maintained. The demurrage bogey need not then cause anybody anxiety; and so far as "troublous and irksome conditions of management" are concerned, these need never exist if one's temperament is normal and devoid of choleric, bilious, or nervous tendencies.

Gas-Works, Broughty Ferry, Feb. 12, 1909. GEORGE KEILLOR.

The Méker Patent Burners and Furnaces.

SIR,—In reference to the article appearing in your issue dated Feb. 9 with regard to the "New Development in Gas Heating," and your comments on same, we should be interested to know what the "new development" consists of, as the "Méker burner" is simply a modification of, but not an improvement on, the "Safety Bunsen" invented by the late Thomas Fletcher, F.C.S., a quarter-of-a-century ago. In fact, tested under similar conditions, the latter still gives much better results in practice.

With up-to-date apparatus, we have melted cast iron (melting point, 1200° C.), and obtained temperatures of over 1500° C., as indicated by Seger cones, and without the use of an air-blast. We cannot therefore regard the melting of copper as a great achievement nowadays. No doubt, many of your readers will remember the lectures given by Mr. Fletcher over thirty years ago, in which he obtained far more marvellous results than this; and we think that they also will be inclined to wonder at the surprise evidently created in the minds of the members of the Cambridge Scientific Instrument Company, Limited.

FLETCHER, RUSSELL, AND CO., LIMITED.
THOS. W. FLETCHER, Managing-Director.

Warrington, Feb. 11, 1909.

Working of Horizontal Chamber-Ovens at Rotterdam.

SIR,—In your issue dated Dec. 29 last, you gave an extract from an article which appeared a short time previously in the Dutch journal "Het Gas," describing and illustrating a new setting of horizontal chamber-ovens erected by the firm of Aug. Klönne at the Oost-Zeedijk Gas-Works at Rotterdam. Having carefully examined the figures given representing the results which are said to have been obtained over a three days' test, I have found what appears to me to be a serious discrepancy either as regards the quantity of gas produced or as to the heating value of same.

In the original article in "Het Gas," it is stated that the yield of gas was 343·23 cubic metres per 1000 kg. of coal (12,320 cubic feet per ton), having a heating value of 5541 calories per cubic metre (higher value) and 4971 calories per cubic metre (lower value) at 15° C. and 760 mm. pressure. These results seemed to me to be so remarkable that I was induced to carry out experiments in my laboratory to prove their correctness. The results of my experiments differ so greatly from those stated to have been obtained in practice, that I feel compelled to ask you to publish my determinations, in order that any incorrectness in the figures may be rectified.

The coal carbonized at the Rotterdam Gas-Works during the test, according to the article in question, was obtained from the Hugo Colliery in the Ruhr coalfield; and the compositition was as follows:—

	Per Cent.
Moisture	2·45
Volatile matters	28·32
Fixed carbons	59·83
Ash	9·40

I obtained good average samples of this coal; and as the result of careful examination, I ascertained that the yield of gas free from H_2S and CO_2 per 1000 kg. of coal amounted to 297·1 cubic metres at 15° C. and 760 mm. pressure, and that the heating value was 5978·1 calories (higher value) and 5319·2 calories (lower value) per cubic metre. This is equivalent to the gas from 1 kg. of coal having a heating value of 1776·1 calories (higher value) and 1580·3 calories (lower value).

The sample of coal examined by me contained 1·28 per cent. of ash, and therefore 98·72 per cent. of pure coal. Allowing for the ash, the heating value of the gas from 1 kg. of pure coal is arrived at as follows:—

$$\frac{1776{\cdot}1 \times 100}{98{\cdot}72} = 1800 \text{ calories (higher value).}$$

and

$$\frac{1580{\cdot}3 \times 100}{98{\cdot}72} = 1600 \text{ calories (lower value).}$$

These figures represent the maximum heating values that are theoretically possible from pure coal; and no allowance has been made for

losses which occur under working conditions, and which arise in charging the ovens and through leakage in the ovens, gas-mains, &c.

Calculating similarly the heating value of the gas from 1 kg. of pure coal from the Rotterdam figures, the following results are obtained :—

$$\frac{343{\cdot}23 \times 5541 \times 100}{1000 \times 88{\cdot}15} = 2157 \text{ calories (higher value).}$$

and $$\frac{343{\cdot}23 \times 4971 \times 100}{1000 \times 88{\cdot}15} = 1939 \text{ calories (lower value).}$$

According to my determinations, therefore, it is evident that the Rotterdam figures require revising.

Examining the question in the other direction—that is, to ascertain the quantity of gas which could be obtained from 1000 kg. of coal on the basis of the heating values ascertained by me, and the Rotterdam figures, it will be found that the amount of gas claimed to have been obtained cannot be substantiated. As already pointed out, the Rotterdam coal contained 88·15 per cent. of pure coal, and the calorific value of the gas from 1 kg. of the coal, including moisture and ash, assuming my figures of 1800 and 1600 calories to be correct, will be as under—

$$\frac{1800 \times 88{\cdot}15}{100} = 1587 \text{ calories (higher value).}$$

and $$\frac{1600 \times 88{\cdot}15}{100} = 1410 \text{ calories (lower value).}$$

Taking these figures and the heating values per cubic metre of the gas obtained in Rotterdam—viz., 5541 and 4971 calories—the quantity of gas to which they correspond is given below—

$$\left.\begin{array}{l}\dfrac{1587 \times 1000}{5541} \\ \dfrac{1410 \times 1000}{4971}\end{array}\right\} = 284 \text{ cubic metres per 1000 kg. of coal.}$$

The quantity of gas stated to have been obtained at Rotterdam—viz., 343·23 cubic metres per 1000 kg.—is apparently much too high, as in the figure of 284 cubic metres no allowance has been made for losses which cannot be avoided under working conditions.

I would like to add that for a number of years past I have carried out carbonizing experiments and distillation tests on coal in a laboratory specially set up for the purpose, and have given special attention to the examination of gas coals. The experiments have shown me that the yield of gas and residuals is dependent almost solely upon the character of the coal, and not so much upon the manner of its treatment, providing that the proper principles of carbonizing be observed. (See "JOURNAL OF GAS LIGHTING," Dec. 8, 1908, p. 681.) I would further observe that the method of treating the coal employed by me has been proved by long experience to give results which tally almost exactly with those obtained in carbonizing coal in bulk in properly constructed ovens under ordinary working conditions. I have the confidence to assert, therefore, that my laboratory determinations cannot be controverted on the ground that they have been arrived at by tests carried out on a small scale.

As it is clearly in the interest of the gas industry that any incorrectness in the published results of the Rotterdam plant should be rectified, I shall be glad if you will kindly insert this communication. Should I have made a mistake in my calculations, I should be glad to have my error pointed out.

HEINRICH KOPPERS,
per O. Victor Kochs.

Koppers' Coke-Oven and Bye-Product Company,
Sheffield, Feb. 12, 1909.

LEGAL INTELLIGENCE.

DEFRAUDING THE BRENTWOOD GAS COMPANY.

At the Essex Assizes earlier this month, Cecil H. Earthy (37) was indicted for embezzling sums amounting to £135, belonging to the Brentwood Gas Company, by whom he had been employed as a clerk. He was also indicted for making false entries in the Gas Company's books with intent to defraud; and for fraudulently converting to his own use £270 with which he had been entrusted by Mrs. Martha Wells, of Lowestoft. Prisoner pleaded guilty to making false entries in the books, but not guilty to the other charges.

Mr. Marshall Hall, K.C. (who, with Mr. Lawless, appeared for the prosecution), said he could accept the prisoner's plea, as the whole of the facts were included in the indictment for falsification, excepting those relating to Mrs. Wells. Prisoner was a man who had been implicitly trusted by his employers. The Brentwood Gas Company had a gentleman named Fielder, in whom they had absolute confidence, as their Secretary. Mr. C. A. Fielder had some private business of his own; and prisoner was employed by him at a salary of £105 per annum. In 1904, Mr. Fielder found, after 35 or 36 years in the service of the Company, that the duties were more onerous than he could discharge. He asked for assistance, and obtained permission to employ prisoner at a salary of £40 per annum, reducing his own salary proportionately. Prisoner was reappointed in 1905 at the same salary; and in 1906 he was permanently appointed, at a salary of £50. That was in addition to his private salary. Altogether prisoner received about £200 per annum. He was the Secretary of the Brentwood Town Hall Company; but some difficulty arose in the summer of 1908 with regard to the accounts, and he was dismissed. The Town Hall Company had an account with the Gas Company; and the Directors of the Gas Company began to feel a little uneasy in consequence of something that came to their knowledge. The accounts were looked into very carefully; and the falsifications, which were very cleverly carried out, were then discovered. In October, 1907, the prisoner wrote to Mr. D. R. Stratford, of Rayleigh, who was a very good customer of the Gas Company, stating that he should want a cheque for £50 on account of coke; adding, "It you do not mind you might in future have cheques made out to me, as we have separated the departments." Mr. Stratford sent the cheque, as requested, to the prisoner, who put the whole of the money into his own account at Barclay's Bank, Brentwood. Having given a receipt to Mr. Stratford, he had to deal with the counterfoil, which, of course, would be available for the purposes of inspection. He got £50 from Mr. Matthews, of Harold Wood, on account of coke, and gave a receipt for that sum; but in order to account for the £50 received from Mr. Stratford, he made out two counterfoil receipts of £25 each. Immediately this was discovered, in August, 1908, prisoner telegraphed to Mr. Stratford, "Do not show any coke bills to anyone until you see me to-morrow." Prisoner saw Mr. Stratford and offered him £50; but he very properly refused to take it. After this prisoner absconded; and it was not until October that he was arrested at Swanley. The military authorities at Warley Barracks were very large customers of the Gas Company. In April, 1907, they paid £88 11s. 8d.; and prisoner entered £71 9s. 9d., leaving £17 1s. 11d. not accounted for. He made up the difference by entering a number of small accounts, including one of his own; and he thereby freed a certain amount of money which he could use for other purposes. The same thing took place in August, 1907, when he received £172 8s. 11d., and entered £145 13s. 4d.; and in October, £159 8s. 10d. was received, and £152 9s. 6d. entered. In each case he altered the figures of gas consumed to tally with the amounts of money entered. The prosecution had no vindictive feeling whatever against the prisoner; but this was a serious matter. It was a deliberate case of falsification, very skilfully carried out, and one to which there was no possible answer.

On behalf of the prisoner, Mr. C. E. Jones said that his friendship for Mr. Fielder had been the cause of his ruin. Mr. Marshall Hall had stated that the prisoner was in receipt of a salary of £150 from one source and £50 from another; but he did not say that it was only comparatively recently—when he had run himself almost to death by working 18 and 20 and sometimes 22 hours a day for a most inadequate remuneration—that those who employed him recognized that it was absolutely necessary they should pay him something which, on the face of it at any rate, would appear to be a living wage. A large part of the work which prisoner had devoted his time to was work which Mr. Fielder ought to have done, work for which Mr. Fielder was paid, and for which the prisoner was not paid. Mr. Fielder, in addition to being connected with the Gas Company, was the proprietor of a brewery and several licensed houses; and he put the whole of the responsibility of this work upon the prisoner, knowing all the while that the prisoner had his duties to perform with the Gas Company. The prisoner had tried to serve two masters—the Gas Company and Mr. Fielder. Quite regardless of himself, he had worked for years without a day's holiday and a day's rest—by night doing accounts, by day running about after Mr. Fielder's business. Mr. Fielder became pressed for money in order to meet accounts. There were accounts to be paid to various brewers and bottled beer merchants; and from time to time Mr. Fielder found a difficulty to provide means to pay for goods which had gone to houses that the prisoner looked after. The result was that, according to prisoner's account, Mr. Fielder was, and had been for years, indebted to him in a large sum of money. Mr. Fielder presented a bankruptcy petition against the prisoner in the autumn of last year, alleging that the prisoner had left his house with intent to defeat and delay his creditors; but the Registrar would not make an order. About two years ago, Mr. Fielder was pressed; and he asked prisoner if he could provide him with some funds. Prisoner said, "No; why do not you borrow some off your friends—the Gas Company?" Mr. Fielder said, "Do you think it could be done?" Prisoner said, "I do not see why they should not lend you some;" and after that the suggestion was made that perhaps it was not absolutely necessary to formally ask the Directors of the Gas Company for some money, but that as Mr. Fielding wanted some, if there was any Gas Company's money in hand available, it should be kept for the present and replaced afterwards. Prisoner lent himself to that; and to cover it undoubtedly falsified the books in the way which had been suggested. He (Mr. Jones) knew that these were very serious aspersions to make against Mr. Fielder. In regard to Mr. Matthews's cheque for £50, £20 of which prisoner was charged with embezzling, undoubtedly he falsified the accounts; but he (Mr. Jones) had in his hand a receipt signed by Mr. Fielder for the £20—"Received £20 in gold; *ex* Matthews's cheque. Signed C. A. F." Of course, prisoner falsified the account; but it was not for any benefit for himself, though it was with intent to defraud the Gas Company. The object was not necessarily to exculpate prisoner, who had undoubtedly done very wrong. He quite appreciated that it was an attack which was being made on Mr. Fielder; but it was made in the Police Court and the Bankruptcy Court, and Mr. Fielder must have known that it must be made that day.

Mr. Marshall Hall said a cowardly attack had been made on Mr. Fielder, who could not defend himself. To show how grossly the facts had been distorted, he would draw attention to the agreement when prisoner was appointed, which was to the effect that Mr. Fielder should still be responsible and give a guarantee for all the moneys that passed through the prisoner's hands. Counsel suggested that prisoner had misinstructed Mr. Jones. He (Mr. Marshall Hall) opened the case perfectly fairly, and he submitted that this attack on Mr. Fielder was an aggravation, and not a mitigation of the offence.

Prisoner was sentenced to three years' penal servitude.

LIABILITY FOR REPAIRING LEAKY WATER-PIPES.

At the Westminster County Court last Tuesday, before his Honour Judge Woodfall, the Metropolitan Water Board summoned the Imperial Property Investment Company for 15s. 2d., expenses incurred in repairing a leaky water-pipe. The facts were admitted; and the only question before the Court was one of liability. Mr. Desmond Collins, the Assistant-Solicitor to the Board, stated that, under their Act of last year, they were authorized, if they thought leakage was going on, to

execute such repairs as might be necessary, and recover the expenses in the way in which the water-rates in respect of the premises concerned were recoverable. The defendants were owners of property at Chiswick, in connection with which waste of water was suspected. The Board excavated, found a leak in the pipe supplying the premises, and gave notice to the defendants, who had plumbers of their own. These repaired the pipe, and the Board reinstated the ground; and it was the expenses of excavating and reinstating that were claimed. Mr. Harvey Samuel, for the defendants, said the claim was not for repairs, but for opening the road. The Board had to find whether or not the leak was the fault of the consumer, and therefore had to lay bare the pipe. It was found to be the consumer's; but it might not have been, and then he could not have been called upon to pay anything. Mr. Collins drew his Honour's attention to the Metropolis Water Act, 1871, under section 29 of which 24 hours' notice to repair had to be given; and he pointed out that there might be 24 hours' waste of water. To prevent this, the provisions to which he had referred in opening had been put in the new Act.

His Honour said he was of opinion that the plaintiffs were entitled to recover; holding that the expenses claimed were incurred in executing repairs. Having excavated, it was found that the concealed pipe was one for which the defendants were liable; and the cost of excavating was part of the expenses incurred. Judgment would be for the plaintiffs, with costs; and if defendants decided to appeal (for which he gave leave), the costs would be on the higher scale.

Consumer Fined for Damaging a Gas-Pipe.

A rather unusual case came before the Nelson Magistrates on Saturday. It was a prosecution, by the Nelson Corporation, of a householder in the borough who was charged with damaging the gas-pipe in his dwelling. It was stated that, the defendant having failed to pay his gas bill, an official from the Gas Department went to the house and disconnected the meter. The defendant was apparently very much annoyed at having his gas cut off, for he ripped the meter out of its place, and threw it into the street, In pulling the meter out, the connecting-pipe was damaged. Defendant argued that the official had no right, in his absence, to enter the house and cut off the gas. The Bench fined defendant 10s. and costs, and ordered him to pay for the damage done to the pipe.

A Mantle Trade Mark Case.

At the Newport (Mon.) Police Court, last Wednesday, Edgar Trace was summoned for selling an incandescent gas-mantle to which a forged trade mark was applied. He pleaded "Not guilty." The prosecutor was J. W. Fisk, of the Vi-Bach Company, which is incorporated in the Incandescent Syndicate, Cardiff. The case for the prosecution was that defendant, at his shop in Commercial Road, Newport, sold incandescent gas-mantles on which had been placed the name of the Vi-Bach Company. The mantles sold were inferior to the "Vi-Bach," and as no one had supplied defendant with the genuine mantles, the assumption was that the trade mark was forged. For the defence, it was argued that the mantles were bought in the ordinary way of business by Trace from a firm calling itself the Vi-Bach Company. Mr. C. D. Williams, the Secretary of the Newport Chamber of Commerce, spoke to witnessing a transaction in Trace's shop between a traveller who alleged that he was selling genuine "Vi-Bach" mantles; and an order was given by Trace for three gross under this idea. The Bench fined defendant 20s. and costs.

The Welsh Quarries Case—Darby Arrested at Last.

At the Mansion House last Friday, Walter Darby, 36, of the Adelphi Hotel, Liverpool, described as a financier, was charged before Sir Walter Vaughan Morgan with conspiring with Septimus Marcus, between Jan. 1, 1904, and Feb. 6, 1906, to defraud certain persons who might be induced to become debenture-holders in the Welsh Slate Quarries, Limited, and the North Wales Quarries, Limited, of moneys and securities. The accused, it may be remembered, was concerned with Gyde and Marcus, who were sent to prison, in promoting the Kent County and West Suburban Gas Companies. Mr. Rowe, who appeared for the Director of Public Prosecutions, said a summons was issued in April last against the prisoner; but he failed to answer it, and a warrant was issued. He had been a fugitive from justice ever since, and the warrant was not executed till last Wednesday, when the prisoner was arrested at Liverpool, where he was staying in the name of Scott. He (Mr. Rowe) proposed to call evidence of arrest only that morning, and apply for a formal remand. Detective-sergeant Hugh M'Lean deposed to capturing the prisoner in Liverpool; and stated that when he was charged at the Minories Police Station he had in his possession fourteen £5 notes and about £3 in money. Mr. Dade, who appeared for the prisoner, expressed his intention of not cross-examining the witnesses on this occasion, and asked Sir Walter if he was inclined to grant bail. His Worship, however, declined to do so at this stage. Mr. Rowe said the prisoner had been a fugitive under a false name, and the prosecution alleged that the public had been defrauded of upwards of £16,000 or £17,000. The prisoner was also an undischarged bankrupt, though he appeared to be an extremely prosperous one, as there was a sum of £10,000 or £12,000 standing to his credit in a bank in London. Accused was remanded.

The Beverley Town Council have accepted the tender of Messrs. Robert Dempster and Sons, of Elland, amounting to £2750, for the construction of a new gasholder.

The Manchester Corporation have accepted the tender of Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, for providing a new outer lift complete, with new cup, carriages, inner vertical stays, channels, and the re-sheeting of the middle lift of No. 1 gasholder at their Rochdale Road works.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at De Keyser's Royal Hotel, Victoria Embankment, E.C.—Mr. CHARLES CARPENTER in the chair.

The SECRETARY (Mr. F. M'Leod) read the notice convening the meeting and the minutes of the last ordinary and extraordinary general meetings; the seal was affixed to the register of proprietors; and the report and accounts (which have already appeared in the "JOURNAL") were taken as read.

The CHAIRMAN: Ladies and gentlemen, in moving the adoption of the report and accounts, I do not think I can do better than, following custom and precedent, take the report paragraph by paragraph and explain in fuller detail than is possible in a printed statement the various features of interest in the Company's working.

THE CONSUMPTION OF GAS.

There is a decrease of gas consumption amounting to 1·7 per cent. in the half year. Now, I need hardly remind you of the important influence exercised upon any business by its standing charges—that is, the money required to pay interest upon capital and the cost of management. There is, generally speaking, a tendency for these to go on increasing, however slightly; but, if the business extends in greater ratio, we shall be working upon a sound economic basis. It is a different thing, however, if, with the same outgoing, there is a lessened volume of business done, on which to make our profits. Notwithstanding the unexpected decrease in our business which has happened in the past half year, we have, for reasons which I shall deal with later on, more than made both ends meet; and after charging everything to revenue which we possibly and legitimately can, we finish the half year with nearly £1500 more in hand than we began with. As regards working costs—viz., those on the debit side of the revenue account—the only item to which I think I need draw attention is the charge for distribution, which is an increased figure even upon the high one of the preceding half year. There are two reasons for this. One is that we have freely transferred to revenue charges formerly carried by a suspense account in respect of "slot" fittings. The other is that the gas consuming public is asking for a more extended service from us than that of merely gas supply. They look to us for assistance in getting the best value for the money they lay out in gas, the cost for which must, of course, be included in the price that we charge for it. The expense attending the conversion of water-slide chandeliers, which is referred to in another paragraph, has also been entered under this heading. The second paragraph of the report deals with the reduced gas consumption and its causes. The decrease of 1·7 per cent. compared with the corresponding half year has a relationship not only with the prosperity of the Company, but with that of South London, which it supplies with gas. We differ from an ordinary trading company in that we cannot extend our boundaries. Therefore, for the prosperity which comes about as the result of an increase in business, we must look entirely within that portion of South London which Parliament earmarked as our area of supply. Now a very large part of this is, in the economic and commercial sense, in a very bad way. Whether we turn to Woolwich and Deptford on the east, or to Lambeth and Battersea on the west, we are confronted with the same signs of, I had almost said, desolation, arising from the large proportion of empty properties. Shops, large and small, in what were once busy shopping thoroughfares, desirable villas and residences in localities where they were once eagerly sought after, are now empty. It has been officially stated that people leave the middle areas of London at the rate of 13,000 families a year. Some, it is true, are re-establishing themselves on its borders; but the greater numbers go beyond. We have ourselves more than 18,000 supplies on which capital was spent in the provision of them, and which are now idle because the users have departed elsewhere. The figures work out to 8½ per cent. of our ordinary consumers and 4 per cent. of the automatic—that is to say, 8½ per cent. are lying idle because the houses and shops are empty, and the slot meter figure is 4 per cent. The 8½ per cent. is important, because the ordinary consumer burns by far the larger quantity of gas. Yet another cause of our diminished business has been the weather and the temperature. It must not be forgotten that our business is nowadays established on a much broader basis than that of supplying light; for year by year we add to it an increasing proportion of heat as well as power. For the last 25 years there has been only one sunnier month of November; and the mildness of December has been too recent a record to be forgotten. These causes have reduced our consumption in the past half year. Then, there is the question of the use of gas for lighting. There is the notable fact of the increase in the use of the inverted incandescent burner, which is the most economical way of burning gas; and this method is increasing rapidly in all directions.

AN INVERTED BURNER FOR STREET LIGHTING.

You may be interested to hear that a design has been worked out in the Company's laboratory of an inverted gas-burner specially adapted for street lighting. It has recently undergone a severe test. In the area of a Suburban District Council owning their own electrical undertaking, the inverted burner was put into competition with the latest form of electric filament lamp (as the undertakers were anxious to light up all their streets), and with such success that an order has been given for several hundred burners to light the whole of their streets with this particular gas-lamp. That is a very satisfactory feature, because the test was a fair one; and it took place in a district where the electric light was in their own hands. Some of these lamps are also about to be fixed on trial in the City of London. I mention this because, apart from its interest, it will give you some idea of the diversity of the duties which nowadays have to be undertaken by an up-to-date gas company who once were content to supply gas alone, but now have to turn their attention to all sorts of matters. One of these was the perfecting of a

gas-burner suitable for lighting streets. I may add we are now at work on one which will be simple and free from some of the inconveniences attached to inverted burners for domestic and other purposes.

THE WORKING RESULTS.

In the next paragraph, mention is made of the working results; and though dividends are not so wholly made in the retort-houses as was once the case, yet they still exercise a considerable influence over them. It is satisfactory to be able to say, therefore, that the quantity of gas sold per ton of coal carbonized is higher—viz., 10,342 cubic feet—than in any previous December half year; and that it constitutes a record. We have also obtained more economical results in the way we use coke as fuel for the furnaces, and many other things. We are ourselves large users of coke, the well-known smokeless fuel. The result has been that there has been more set free for sale; and this has affected our balance-sheet on the right side to the extent of some 13,000 or 14,000 tons in the half year. But in spite of this, the returns from residuals are, as stated in the report, some £27,000 lower. Most of this is accounted for by the lower price coke has fetched; and this is largely influenced by the depressed condition of the cement trade. A sort of working partnership has existed for many years between ourselves and the manufacturers of cement, who take from one-third to one-fourth of our production. The arrangement is mutually advantageous; for, on the one hand, we do not place in London all the coke we produce, and, on the other, it is an excellent fuel for them so long as the price is fixed with some regard to that of cement. We have in the past been content with fair prices; for we realized that it is to our interest in the long run to help the manufacturers in their competition with other producers in different parts of the world. We may say, in a word, that cheap coke is to the cement trade what cheap coal is to our Company; and although in times of scarcity we might perhaps get better prices by going outside our usual customers, yet, so long as they meet us fairly, I am convinced that it is more profitable in the long run to support those industries which take a large proportion of our output year by year. Our tar products maintain their character for quality, which results from the care and skill exercised in their manufacture. There is one particular product we make from our tar which is preferred in Germany to any other make in England. When I say that, it is paying a very high compliment to the skill with which your tar business is run by the Tar-Works Manager and his assistants. Another advantage we have is that we sell ourselves, and as far as possible direct to the users. This, of course, helps us to keep clear of the speculative buyer, who has not the same interest as ourselves in maintaining prices. This is of particular advantage, as prices have been falling to a considerable degree.

USE OF GAS FOR POWER AND INDUSTRIAL PURPOSES.

The next paragraph refers to the use of gas for power and other industrial purposes. These are so diverse that I should take up too much of your time by describing them, though the installation at Shad Thames is sufficiently important to deserve special mention. The problem of sewer accommodation at times of heavy rainfall is one that has caused great anxiety to the responsible authorities. The main sewers, which are of adequate capacity under ordinary circumstances, are quite inadequate in times of storm and heavy rainfall; and overflows into the Thames have been provided to meet such contingencies. As, however, the sewers are below high-water mark, the overflows would be useless unless the storm water is pumped up to such a height as will allow it always to flow into the river. Motive power had to be available for the purpose in connection with sewer accommodation day and night throughout the year; and it is satisfactory to know that gas has been found to answer this requirement better than anything else, and was therefore adopted by the London County Council when the station was laid out. On the question of the use of gas, I wonder how many persons know that large quantities of cocoa are manufactured, and coffee roasted and ground, on the wholesale scale in South London by coal gas. I dare say it may be news to many of you that the type with which several of the morning newspapers are printed is run from melting pots heated by gas. One works alone has for this particular purpose four 3-ton melting pots, which melt 3 tons of type in use during something like twelve hours daily. Those are the two extremes which occur to one as being interesting cases; and they will give you some idea of the broad basis on which the business of supplying gas now rests.

THE BERMONDSEY EXPLOSION.

The report next refers to the safety attending the use of gas—a character it has long borne, and to which it is well entitled. Nor is this discounted by the occurrences of which the report reminds you, and of which the most serious was the explosion in Grange Road, Bermondsey, late last year. That occurrence is a unique one in the history of the Company; and the state of things disclosed by its investigation is so remarkable that I must ask your indulgence while I now deal with it in a fuller manner than was possible in the report. Some 20 years ago, a new sewer was constructed in Grange Road, Bermondsey, by the London County Council. Instead of filling up the old, disused, and imperfect one, and making the road solid, sound, and secure, as it should have been, it was simply discarded. The sewer was a good many feet below the road level. The superincumbent earth gradually found its way through cracks and crevices into the sewer itself, until at last a 9-inch water main running along one side of Grange Road was no longer able to carry its weight—a long length of it being unsupported by reason of the slipping away of the soil. This long, unsupported length gradually settled. Now, in the ordinary way, it would have settled gradually, and nothing would have happened. But on the water-main was a branch or spur for supplying a particular customer with water. The supply had been cut off, but the branch had been left; and when the new sewer was constructed, this branch was improperly built into an inspection shaft which ran upwards from the sewer. What happened? The main sunk because the supporting earth had gone away from it. In the ordinary way, the main would have followed without any mishap; but, owing to the fact that the spur was made fast to the brickwork, it broke at that particular point, and the water poured out. You all know the force of water when you have a condition of affairs of this kind. The water completed the mischief and washed away the earth below the surface of the road, and a huge cavity was created—a cavity large enough to have engulfed any vehicle laden with either merchandise or humanity passing at the time. It so happened that where this particular cavity was there was a gas-main; and the causes which led to the non-support of the water-main led to the sinking and fracture of the gas-pipe. The gas-main broke from the same cause; and the gas found its way through the soil into the sewer, which had been conveniently left by the sewer authority beneath. In some way, the escaping gas became ignited. Some say that the gas officials ignited the gas when endeavouring to locate the leak. That is not so. The Gas Company's officials were busy searching for the leak with the most up-to-date safety lamp which ingenuity and skill have perfected. They were not searching for the leak with tarred yarn in the manner suggested; but they were searching with a safety lamp. An explosion did happen; and in all probability the cause of the explosion was a fire in a watchman's hut. Some distance away, at the other end of the road, the Local Authority were repairing the road, and there was a watchman's box with the usual fire associated with it; and in all probability the ignition of the escaping gas was caused by that watchman's fire. We do not know; but we believe that to have been the cause. The explosion which took place unfortunately killed two children playing in the side walk. Now, while deeply sympathizing with the bereaved parents, it would not be fair to assume a responsibility which we say unhesitatingly should be borne by other shoulders. At the same time, if we can, by an act of grace, render assistance to the sufferers, and which act cannot be construed into an admission of liability, you may be quite sure your Board will not be behindhand in performing it. (Cheers.)

THE WATER-SLIDE CHANDELIER.

Apart from this most exceptional occurrence, trouble has been only with water-slide chandeliers. It was stated at a previous meeting that the whole of our customers had been circularized with a proposal to alter their water-slide chandeliers and make them up-to-date. A good many of our customers responded; but a great many did not. We then decided that the alteration was so much in the interests of the gas-using public that we would carry it out free of charge; and a fresh set of circulars was sent out, informing consumers of what we would do. We had a great many take advantage of the offer; but still troubles arose, and we had an unfortunate explosion in a public-house by which a barman who was looking for a gas leak lost his life. We had an explosion in a district which had been most carefully circularized in order to eliminate all these faulty appliances; so we found that it was no use depending upon circulars, and we then made house-to-house visits. Thousands of these unsuitable appliances were found to exist, notwithstanding our previous circularization. We are now dealing with them at the almost incredible rate stated in the report; and experience has taught us the futility of circulars as compared with canvassers. It is much more important to rely upon personal efforts than any circular, however strongly worded, sent through the post.

CO-PARTNERSHIP.

The next paragraph of the report is connected with co-partnership; and this continues to flourish both within and without the sphere of the Company's operations. Times of trial test the truth of friendship more searchingly than any other. In the history of our co-partnership scheme—now in its twentieth year, for it was launched by the late Sir George Livesey in the year 1889—the most remarkable manifestation of the way in which the oft-considered relationship of employer and employed was welded into one was when your entire staff, some thousands in number, followed their late Chief to his last resting place. He had often told at this meeting of the unity which has sprung up between all classes in your employ; but I think we may say that it was reserved to the Leveller of all rank to reveal how deep and sincere that unity was.

THE MEMORIAL TO SIR GEORGE LIVESEY.

May I take this opportunity of expressing the thanks of the Board for the generous response by the shareholders to the appeal for subscriptions to enable a suitable memorial to be erected to the memory of the late Sir George Livesey? The execution of the work has been entrusted to Mr. F. W. Pomeroy; and the cost has been fully provided for by the subscriptions of yourselves, the workmen, the officers, and the directors. The statue will be our personal tribute to our beloved friend, and one which I am sure will be an inspiration to all those charged with the duty of carrying on your business for many years to come. As a Company, we have been asked to take part in another testimonial of another character, in which the gas industry of Great Britain is desirous of leading the way. It is true that a great deal of the hardship from which the country is suffering arises from its neglect of Science. While other nations have spent large sums of money on the endowment and prosecution of research, we have, as a nation, woefully neglected our opportunities. There is no doubt whatever about that. We have trusted to chance for stumbling upon Nature's secrets, instead of applying ourselves to their methodical discovery. Industry is in these days beginning to realize the folly of such proceedings; and our own particular one has determined to set its house in order by founding at the Leeds University a Livesey Professorship of Gas Engineering. This Company have been asked to take the lead in that endeavour; and it cannot but produce good results to the industry in which we are engaged. I think I may bring the matter home to you in respect of the particular industry of gas making, if I call your attention to an important fact which may easily have been overlocked and which may easily be forgotten. The basis of our working is, as you know, the supply of gas of 14-candle power. We got permission to come down to that quality some years ago, on account of, among other reasons, the increasing use of gas for other purposes than direct illumination. And while the average quality of gas which we are able to supply by our present method of manufacture is about 16·4 candles, the average we should supply, if we knew how to do it, would be 14·4 candles. Unfortunately, we do not know how to do it. Now, the money value of the 2 candles difference between 14·4 and 16·4 is a very considerable one. It has been put at as much as 1d. per candle; and if it were a 1d. per candle, this would be £100,000 a year. If it were ½d., of course, it would be £50,000.

But at any rate, I have said enough to enable you to appreciate that it is a very large sum indeed. As manufacturers of gas, we have exhausted our efforts to introduce a 14·4-candle gas. The late Sir George Livesey himself was strongly of opinion that we had come to the end of our power in the matter; and he realized that the progress which would be made in that way would be progress which would emanate from the laboratory rather than the works. Some few years ago, he interested himself in founding a Chair of Gas Engineering at Leeds University; and he said that he would make himself responsible for collecting the necessary amount year by year. The sum required is some £500. To raise this, your Company subscribed, and others did likewise; and the Chair has now existed some two or three years—not long enough to show great results, but still long enough to give us hope for the future. Now the gas industry of Great Britain saw that here was a fitting opportunity to promote their interests as producers of gas and at the same time memorialize the late Sir George Livesey. And they have decided to take over the responsibility of providing that Chair. (Hear, hear.) The Chair will then be called the Sir George Livesey Chair of Gas Engineering; and contributions for this purpose have been received from all quarters of the kingdom, from different companies, corporations, and individuals. Now I think I ought to tell you to-day that your Board had for some time past had under consideration the desirability of this Company subscribing thereto. You see, the advantage to the Company is, as I have pointed out, a double one. In the one case it is perpetuating the memory of Sir George Livesey, and in the other, spending money which will, at some future time, at any rate, sooner or later, bear fruit; and the Board have decided that a contribution of £2000 from the Company would be an adequate and proper one for them to make. (Hear, hear.) As a matter of course, it does not appear in the accounts which have been presented this afternoon; but I mentioned it because I felt sure it would meet with the approval of the shareholders here to-day, and I thought with that approval which I believe exists it would be quite a simple matter for the amount to appear in the accounts for the current half year. That is my object for having mentioned this now.

A NEW WORKMAN-DIRECTOR.

I must take this opportunity of introducing as a Workman-Director Mr. W. H. Cupit, who took his seat for the first time at this meeting. He is employed in the Distribution Department of the Company, which now has for the first time a representative on the Board. As the other Workman-Director is employed in the Works Department, both these branches of business are now adequately represented; and the Board feel that they have in both these gentlemen loyal and devoted colleagues.

THE REPORT AND ACCOUNTS ADOPTED.

I now formally move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. JOHN EWART, in seconding the adoption of the report and accounts, said there was really very little left for him to say after the exhaustive speech of the Chairman. He might, however, be allowed to congratulate him on his excellent speech; and although they all deplored the loss of his predecessor, they must congratulate themselves that a large share of the late Chairman's mantle had fallen on his successor. It was also satisfactory to feel that the very responsible step which the Board had taken in electing Mr. Carpenter to the position of Chairman had been fully justified.

The CHAIRMAN then invited questions and criticism; but no one rose, and the resolution was put and carried unanimously.

THE DIVIDEND.

The DEPUTY-CHAIRMAN (Mr. Robert Morton) moved: "That a dividend at the rate of 5½ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. W. H. CUPIT seconded the proposition, which was at once agreed to.

RE-ELECTION OF DIRECTORS AND AUDITOR.

The CHAIRMAN moved the re-election of Captain T. B. Heathorn as a Director, and said that Captain Heathorn had been the longest elected Director on the Board.

A SHAREHOLDER seconded the resolution, which was carried unanimously.

The CHAIRMAN then moved the re-election of Mr. Frank Bush as a Director. He remarked that Mr. Bush had proved himself as admirable a Director as he was an efficient Secretary.

Mr. GEORGE HOWLETT, who seconded, said that many of them had known Mr. Bush for a number of years in connection with the Company, and knew the value of his work and his business capacity. They were perfectly confident, when he was elected, that the right man was being put into the right place.

The resolution having been carried unanimously,

Captain HEATHORN, in returning thanks, said he had seen many changes while on the Board. Some had been what they could bear, because they were bound to face them—the fate of all men and women. He thought they would find that at present, though they had sustained a loss which it was very difficult to overcome, they had the path of prosperity open to them. The election of Mr. Carpenter to the Board had been a subject of very great thought. It had presented unusual difficulties in many ways, which he would not go into, because it was unnecessary. They were, however, all aboard now; and he was sure the old ship would float just as well as ever.

Mr. FRANK BUSH also briefly returned thanks for his re-election.

Mr. C. Mortimer was next unanimously re-elected an Auditor of the Company.

VOTES OF THANKS.

Mr. HARRY KEEP, in proposing a hearty vote of thanks to the Chairman, remarked that, as had been said, the mantle of their departed Chairman, Sir George Livesey, seemed to have fallen on good shoulders. If their present Chairman continued to give them such lucid explanations and such exhaustive commentary on the working of the Company as he had done that day, surely they had done the right thing in choosing him as Chairman.

Mr. HOWLETT seconded the resolution, which was carried unanimously.

The CHAIRMAN, in returning thanks, said success in his position depended very largely upon the degree of efficiency with which the staff performed their various duties and functions. The Company had in every respect a most efficient and a most admirable staff; and he took the opportunity of asking the shareholders not to forget them—not to forget the real workers. He therefore proposed that the best thanks of the meeting be given to the staff for the thoroughly loyal and efficient way they had carried out their duties for the past half year.

The proposal having been seconded and carried unanimously,

The SECRETARY returned thanks; remarking that he had good opportunities of gauging the feelings of the employees of the Company in all grades, and he was sure that, were any stimulus needed to keep them up to "concert pitch," the desired effect would be produced by such a vote. As a matter of fact, the whole of the employees were imbued with the same desire to give loyal and effective service to-day as they had for many years displayed under the leadership of their late Chairman. He could assure them, from his own personal knowledge, that the events of the past few months had not diminished, but had really tended to cement, that very strong feeling of mutual co-partnership which was, to so large an extent, the guiding spirit of the whole of the work put in by the employees of the Company.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors for the six months ending the 31st of December, which, with the accounts, will be presented at the half-yearly general meeting on Friday.

It is with profound regret that the Directors have to record the death of their esteemed colleague, Sir George Livesey, who became a Director of the Company in March, 1875, and was elected Chairman in 1894. Sir George's great knowledge and supreme ability were unsparingly devoted to the interests of the Company; and to this is largely due its success and present prosperous condition. Mr. Robert Morton, who has been Deputy-Chairman for some years, has been unanimously elected to succeed Sir George as Chairman.

After careful consideration of the qualifications of several candidates, Mr. Charles Carpenter was elected to fill the vacancy on the Board. Mr. Carpenter had been for many years in the service of the South Metropolitan Gas Company, latterly as Chief Engineer, and is now Chairman. The Directors believe that this appointment will prove of much benefit to the Company.

The reduction in the price of gas to 2s. 6d. per 1000 cubic feet, which operated during the whole of the half year, resulted in a falling-off of £2312 in the receipts for gas. The amount received for coke was less by £5730, and for tar £739. On the other hand, ammonia yielded £193 more, and coal cost £6922 less; and, in addition, considerable economies have been effected in working expenses.

The net result of the half-year's working is a profit of £22,687. This is sufficient to enable the Directors to recommend payment of the full dividend authorized under the sliding-scale—viz., at the rate of £5 10s. per cent. per annum—and that £9681 be carried forward.

Notwithstanding a slight falling-off in the sale of gas, the business of the Company continues to expand. More than 620 new customers have been obtained, 620 additional cookers and about 700 additional gas-fires have been supplied, and 40 more public lamps have been fixed. Two new show-rooms have been opened—one in Beckenham, the other in South Norwood—and these are proving to be of great convenience to the consumers, and at the same time are promoting the use of gas.

Co-partnership continues to be very popular. It contributes largely to the smooth and regular working which prevails in all departments of the Company's business. The amount now invested by the employees is £31,193. The proprietors will doubtless be interested to know that several gas companies have adopted the system during the past year.

Two Directors (Mr. Robert Morton and Mr. Jabez Light) and one Auditor (Mr. Thomas Guyatt) retire from office at this meeting. They are all eligible, and offer themselves for re-election.

The accounts accompanying the report show that nothing was spent for capital purposes in the second half of the year. The total capital expenditure on the 31st of December was consequently the same as at the close of the preceding six months—viz., £806,636, or £24,727 less than the receipts, including the premium capital, or £831,363 in all. The net revenue from the sale of gas was £82,296; the rental of meters and stoves produced £6369; the sale of residuals, £26,426; and a small item of rents brought up the total receipts to £115,198. The following were the principal items of expenditure: Manufacture of gas (including £46,818 for coal and £11,175 for maintenance of works and plant), £64,304; distribution, £15,807; management, £5400—rents, rates, and taxes (£4606) and miscellaneous items bringing up the total to £92,510. Among these items is a sum of £1500 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £22,687; and the amount applicable for dividend is £27,819.

The statements as to working show that 62,100 tons of coal were carbonized in the half year. The quantity of gas made was 714,076,000 cubic feet, of which 659,953,000 cubic feet were sold and 668,041,000 cubic feet accounted for. The residuals were: Coke, 745,200 cwt., of which 167,048 cwt. (estimated) were used in manufacture; breeze, 11,946 yards; tar, 586,722 gallons; ammoniacal liquor, 16,323 butts—the make of sulphate of ammonia being 644 tons.

Reduction in Price at Scarborough.—The Directors of the Scarborough Gas Company have decided to reduce the price of gas to the ordinary consumers by 2d. per 1000 cubic feet, the change to take place at the end of the present quarter.

BRENTFORD GAS COMPANY.

Current Prosperity and the Increased Costs of Business.

The Half-Yearly General Meeting of the Company was held last Friday, at St. Ermin's Hotel, Caxton Street, S.W.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he thought that, on the whole, the proprietors would agree with him that the report and accounts were very satisfactory. They would find first of all that the increase in the sales of gas was 5 66 per cent. This was really gratifying, having regard to the fact that several other companies had had to measure not an increase, but a decrease. The weather during the half year had been much against the consumption of large quantities of gas; and therefore it was pleasing that the Brentford Company had no less than 5·66 per cent. upon an increase in the corresponding period of 7 per cent. The proprietors would have noticed that for some few years past the conduct of a business of this kind had been rather more costly than before; but he did not think there would be any difficulty in convincing the proprietors that the methods of conducting the business were sound. On the gas, meter, and stove rental, there was an increase of £11,034; but, on the other hand, coke had returned £1875 less. Knowing the state of the coke market, it was not a surprise to find this diminution. On the other side of the account, coal had cost much more; but they could not control the market any closer than they had done. There were two items to which he specially wished to call attention. They had reference to repairs and maintenance of works and plant, and repairs, maintenance, and renewals of mains, &c. The policy always followed in this Company - and it was the only right one—had been to thoroughly maintain their works in good order. It was not much use having a machine unless it worked efficiently; for the more efficiently it could be worked, the more economical it was. If they wished to extend business, as he was thankful to say this Company were extending theirs, care must be taken to sustain the existing business. It was no use, too, selling gas cheaply, nor was it any good having a large demand, if they had not sufficient pressure to supply it. One of the great difficulties they had had with this Company had been of a structural character. The result had been a difficulty with pressure—notably at Barnes; and this had caused a great deal of anxiety to the Engineer. The business had gone on increasing and increasing, and this had accentuated the difficulty they had between the two stations. The one at Southall was much more expensive to work than the one at Brentford; and so they had thought it better to connect the two by a new 30-inch main. This was a costly job, and accounted for an increased expenditure of £8000. It must be borne in mind that they required not only a greater pressure to keep up the supply, but also for lighting by incandescent burners. He did not know whether the proprietors understood the difference in the costs of working Brentford and Southall. The former was a small station situated on the river, with a street running on one side. It was a narrow street, and was constantly congested with traffic, and congested partly with their own carts. On the opposite side of the street, they had squeezed in parts of the plant other than the carbonizing, including the holders and the offices. It was a difficult station therefore to work freely. The Southall station was about 5 miles away. It was a splendid works; and there was plenty of land there. But they were confronted with this difficulty: It was a more expensive station to work than Brentford, because there were much greater dues upon it. Speaking roughly, coal cost at Southall about 1s. a ton more than at Brentford. They could not, however, expect to use Southall merely as a relief station to Brentford. They had to work the two stations; but they were difficult to work economically in that way. Turning to other matters, he was glad to say they had been doing very well, and he hoped they would do still better, with regard to the District Councils. They had recently been making arrangements with several of them, and hoped to do more, in settling agreements for street lighting by gas, in some cases instead of electric lighting, under five years' contracts. Then they had been doing all they could with the consumers. The show-rooms were doing very well indeed; and they had adopted the system of house-to-house visitation by a lady demonstrator. She visited the houses, and got on good terms with the consumers. In a report received from the lady demonstrator the previous day, she stated that since her previous report (dated April 11, 1908), she had made 1341 calls, making with the number formerly visited (588) altogether 1925 visits. The personal lessons given had averaged five in seven. "Gratitude," she remarked, "is not generally considered a human attribute; but if some of the appreciative remarks could be heard by your Directors and shareholders, they would consider their enterprise amply rewarded, as it engenders much good feeling towards the Company, leading to gas-stoves being retained, and not returned." He (the Chairman) thought there was much more in that. If they made people contented with gas it must do good. This brought him to the point that in dealing with gas they were too apt to think only of light. He had felt for a long time that too much attention could not be given to heating and cooking. Some people cooked and burned gas for heating so ignorantly that they would not continue to use it. It was their business, as they wanted to sell as much gas as they could, to change this ignorance to knowledge. This, however, cost money; and he quite agreed they were spending a lot out of revenue, though he did not think they would have to spend so much in future. But it was quite necessary they should go on spending to a certain extent. One of the great features of the Company had been its low capital per ton of coal carbonized. It had been their consistent policy to keep this down. If they looked round, they would see that those companies with a low capital per ton invariably charged less for gas, and that was absolutely a vital point. He did not think the reduction of price affected so much the lighting part of the consumption. People would have for lighting gas or electricity just as fancy dictated; but they did regard the question of the charge for gas in the kitchen, where they found it very convenient. The first step towards cheap gas was to have the works in order; and in this respect their Company was on a sound basis. There was another matter, and that was the officers' superannuation scheme. It only came into operation on Jan. 1 last, and he thought it was a very useful and acceptable measure to the proprietors, the directors, and the officers. As he had said before, it was just as well they should know what the Company were liable to in regard to the officers, and it was as well the officers should know to what they were entitled. Looking forward, he felt very sanguine the Company had a great future before it. They had had, and were having, a large expansion of business in a rapidly extending district. They had a first-rate staff of officers who were heart and soul in their work; and they had one of the lowest capitals per ton of any gas company.

Mr. HOWARD CHARLES WARD seconded the motion, remarking that a great feature of the Company was the way in which capital charges had been kept down.

Mr. A. B. BOSHER congratulated the Directors upon the good report they had put before the proprietors. Money was being spent in a rational manner, and producing great results. In this the Directors were doing a wise and proper thing. He had given notice of a motion for increased remuneration to the Directors; and it was incumbent on him to state his reasons. He had been a shareholder for 25 years; but it was longer than that since the remuneration of the Board was fixed—in fact, it was 28 years ago since their remuneration was last fixed. At that time, the Company were producing 660 million cubic feet of gas; while last year the output was nearly 2900 millions, or almost five times as much. Since the fees were last settled, the Directors had been working whole-heartedly for the Company; and the proprietors knew with what result. "Field's Analysis" showed that out of the whole list of London and Suburban Gas Companies, their Company stood the lowest in respect of Directors and Auditors' fees. Brentford stood at 0·21d. per 1000 feet; while one Suburban Company came to 1·72d. He would move his resolution at a later stage of the proceedings.

Mr. H. D. ELLIS remarked that he had supported this and other companies in economizing capital, and carrying to revenue everything that could legitimately be so carried. This Company had consistently acted upon the principle. With that, therefore, he would be the last to find fault. But it did strike him the Board had erred on the side of excess caution; they had, indeed, acted almost heroically in their treatment of revenue. So much so, that on this occasion wear and tear amounted to practically 1s. per 1000 cubic feet. They had a light capital and a good concern; and he did think the Directors might have taken about £850, and given the proprietors (say) 12¾ per cent. Perhaps the Board would bear this in mind when considering another matter—the reduction of the price of gas. With this slight qualification, he must proclaim himself entirely in agreement with the Board's policy.

The CHAIRMAN replied that the Board had the keenest eye to the proprietors' interest; but they did not want to be hampered with giving a higher dividend until they had completed the work of putting the plant into thorough order.

The motion was unanimously carried.

Mr. BOSHER then moved a resolution giving the Directors power, as from the commencement of the current year, to take from the funds of the Company £3000 a year instead of the £2000 as remuneration for their services.

Mr. J. REESON, in seconding the proposition, said a good deal had been said as to the Company's economy of capital. He had made a few comparisons between the Company and what they used to call the extra-Metropolitan Companies—those which were somewhat affected by the Metropolis Gas Act of 1860. There was a little schedule of them at the end of the Act. Some of them had become amalgamated with other Companies; but there were five left—the Brentford and four others. Since the Directors' remuneration was last fixed, the progress of the Company, as compared with the progress of the other four Companies, had been as follows. The Brentford Company had increased their output by 1986 million cubic feet; the four other Companies by 3756 million cubic feet. The Brentford capital on which dividend and interest was payable had increased by £394,000; the other Companies by £1,376,000. So that, if they made a rule-of-three sum, it would be seen the Brentford dividend-paying capital should have increased by £727,000; it had increased by only £394,000. If there had not been this difference, the extra capital charges would have amounted to about 3d. per 1000 cubic feet. The fees of the Directors only amounted to 0·18d. per 1000 cubic feet; while the fees of the other Companies equalled 0·36d. per 1000 cubic feet. They were now asking their fellow-proprietors to add only half to the 0·18d., making it 0·27d.; so that the fees would still be in relation to consumption one-third less than the other four Companies.

The motion was unanimously carried.

The CHAIRMAN, in acknowledging the resolution on behalf of himself and his colleagues, said they could not help feeling it as a mark of the proprietors' appreciation.

Proposed by the CHAIRMAN, and seconded by Mr. WARD, dividends were declared at the rate of 5 per cent. per annum on the 5 per cent. preference stock, 12½ per cent. on the consolidated stock, and 9½ per cent. on the new (1881) stock.

Proposed by the CHAIRMAN and seconded by Mr. WARD, the retiring Directors (Mr. R. Shafto Adair and Mr. William King) were re-elected. The Auditors (Mr. Monier F. Monier Williams and Mr. Alfred Bevis) were also re-appointed, on the motion of Mr. T. WILKINS, seconded by Mr. J. REESON.

The CHAIRMAN observed that one of their most valued officers was Mr. Mann. His service to the Company had been a long one; and it was some little time now since his salary had been considered. He therefore moved that it be increased by £100 a year.

Mr. WARD remarked that he claimed the right to second this. Mr. Mann's father was a valuable friend of his own, and he was the old Engineer of the late City of London Company. He (Mr. Ward) had something to do with Mr. Mann's election to the position, and he had never regretted having done so.

The motion was unanimously carried.

Acknowledgment of the services of the Chairman and Directors, and of the Engineer and Manager (Mr. Alex. A. Johnston) and the Secretary (Mr. W. Mann) concluded the proceedings.

SHEFFIELD UNITED GASLIGHT COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented by the Directors at the half-yearly general meeting of the Sheffield Gas Company on the 8th prox., they state that the consumption of gas during the six months from July to December, 1907, showed the large increase of 8·13 per cent. over the corresponding period of 1906; and though the trade of the city in the past year was in a very depressed condition, and the weather during the later months of the year was exceptionally fine and mild, there was but a slight decrease—viz., 1·04 per cent.—in the quantity of gas sold to the end of December. Having regard to the circumstances referred to, the Directors consider this is highly satisfactory. The net profit for the half year, after payment of interest on the debenture stock, is £38,072; and the amount required to pay the usual dividend is £43,424. It will therefore be necessary to take £5352 from the balance brought from previous half years. The sum then remaining to carry forward will be £81,443. The price received for gas during the half year averaged 1s. 3·07d. per 1000 cubic feet.

The accounts accompanying the report show that the sale of gas in the half year produced £105,106, residuals brought in £64,459, and the total revenue was £180,170. The expenditure on the manufacture of gas amounted to £110,353 (coal costing £68,605, and repairs and maintenance of plant £21,433); on distribution, £14,791; and on management, £6049; rents, rates, and taxes came to £9634; and the total expenses were £142,220. The balance carried to the profit and loss account is £37,950.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the sales of gas exceeded those of the corresponding period of 1907 by 1·39 per cent. The number of consumers increased in the half year by 1068, and that of stoves on hire by 1132; and 241 stoves were sold to consumers. They remark that but for the mildness of the autumn and winter, a larger increase in the sale of gas would probably have been experienced. The depressed state of the markets for coke and breeze adversely affected the receipts from these residuals. The show-room at Purley has been enlarged; and additional premises have been acquired at Wallington for distributive work in that district. The productive capacity of the carburetted water-gas plant has been increased by alterations carried out on two of the generators. The Directors add that they have introduced for the benefit of the Company's employees a co-partnership scheme on the lines of those successfully in operation with neighbouring Companies; and they explain that they have done this with the twofold object of improving the position of the employees and of encouraging among them a spirit of thrift and a greater interest in the Company's affairs, to the benefit of consumers and proprietors.

The accounts accompanying the report show that the total revenue was £115,432, of which £83,855 was derived from the sale of gas, £8435 from the rental of meters and stoves, and £23,027 from the disposal of residuals. A sum of £60,319 was expended on manufacture, and £16,519 on distribution; rents, rates, and taxes came to £4321; management cost £4125; and the total expenses were £90,777. The balance carried to the profit and loss account is £24,655; and the amount available for distribution is £27,830. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,241, and leave a balance of £5589.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 41,292 tons of coal and 484,412 gallons of oil were used during the half year to manufacture 645,190,000 cubic feet of gas, of which 603,049,900 feet were sold and 610,639,700 feet accounted for. The estimated quantities of residuals produced were: Coke, 24,775 tons; breeze, 6124 tons; tar, 482,613 gallons; ammoniacal liquor, 1,162,095 gallons—the make of sulphate being 347 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Half-Yearly Report and Accounts—A Reduction in Price.

The report which the Directors of the Tottenham and Edmonton Gas Company will present at the half-yearly general meeting on Saturday, conveys to the proprietors the satisfactory announcement that in the six months ending the 31st of December there was an increase to the extent of 7·63 per cent. in the sales of gas, compared with the corresponding period of the year 1907; while 4291 additional consumers were placed upon the books, and the number of cooking and heating stoves in use was augmented by 6873. It is gratifying to find that the scheme of co-partnership which was approved by the proprietors at the last general meeting has been successfully launched, and has already added 400 names to the list of stockholders. The Directors consider that the general position of the Company's affairs justifies a further reduction in the price of gas; and they have accordingly decided that as from the 1st ult. the charge shall be 2s. 5d. per 1000 cubic feet. Under the supervision of the Engineer and Manager (Mr. A. E. Broadberry), the manufacturing and distributing plant of the Company was maintained in a condition of thorough efficiency.

The accounts accompanying the report show that the revenue from the sale of gas was £89,481; the rental of meters, stoves, and fittings and the receipts for the maintenance of incandescent mantles amounted to £14,009; the sale of residuals produced £19,072; and the total revenue was £122,603. The expenditure on the manufacture of gas was £70,096 (coal costing £37,313, and repairs and maintenance of works and plant £12,559); on distribution, £18,575; on management, £4036; on account of co-partnership for the year ending the 30th of June next, £1000; and rents, rates, and taxes (£4868) and miscellaneous expenses make a total of £102,676. This leaves a balance of £19,927 to go to the profit and loss account. After providing for interest charges and setting aside £3971 for the co-partnership bonus, there remains a balance of £12,373. The amount brought forward being £20,494, the sum available for distribution is £32,867; and the Directors recommend the payment of the statutory dividends of 6¾ and 5¼ per cent. per annum on the two classes of stock. This will absorb £14,315, and leave £18,552 to be carried forward.

The statements relating to the working in the half year show that 44,699 tons of coal and 646,986 gallons of enriching oils were used in the production of 790,795,000 cubic feet of gas, of which 714,355,000 cubic feet were sold and 727,746,000 cubic feet accounted for. The estimated quantities of residual products were: Coke, 26,819 tons; breeze, 4231¾ chaldrons; tar, 435,467 gallons; ammoniacal liquor, 12,416 gallons—the quantity of sulphate made being rather more than 368 tons.

THE CHEAPEST GAS IN LONDON.

The report which the Directors of the Wandsworth and Putney Gas Company will present at the half-yearly meeting next Tuesday contains an announcement which will be read with pleasure alike by consumers and shareholders; for they will learn that the price of gas has been reduced from 2s. to 1s. 11d. per 1000 cubic feet as from Christmas last, and that thereby the Company have been placed in the unique position of supplying gas at what is unquestionably a record figure for London and its suburbs. This is the salient feature of the report. The accounts for the six months ending Dec. 31 which accompany it show a balance of £13,904 on the revenue account—the income having been £81,488 and the expenditure £67,584—and a sum of £19,151 available for distribution. The Directors therefore recommend the declaration of dividends at the rates of 8 and 6½ per cent. per annum on the two classes of consolidated stock, and of £5 12s. per cent. per annum on the ordinary stock. The Company made in the half year 543,192,000 cubic feet of gas, of which 509,840,000 cubic feet were sold and 516,087,000 cubic feet accounted for. The quantities of coal and oil used were 33,994 tons and 391,573 gallons respectively; and the estimated production of residuals was: Coke, 20,396 tons; breeze, 3529 tons; and tar, 418,126 gallons. The ammoniacal liquor yielded 330 tons of sulphate.

BRISTOL GAS COMPANY.

The Annual General Meeting of this Company was held at the Offices last Thursday—Alderman J. W. S. Dix in the chair.

The Secretary (Mr. John Phillips) read the notice convening the meeting, and the report and accounts for the year ending Dec. 31 last were presented. It was stated in the former that the increase in the sale of gas and residuals continued to be satisfactory; while the latter showed a balance on the profit and loss account of £43,770 available for distribution. An interim dividend was paid last June; and the Directors recommended the declaration of one at the rate of 5 per cent. per annum for the six months ending in December.

The Chairman, in moving the adoption of the report, said he had no intention of dealing at length with it or with the figures in the accounts, because these had been before the shareholders for some time, and all he had to do was to congratulate them on receiving their full dividend, and on the fact that they were carrying forward a handsome balance (£13,332). It had been proposed to go to Parliament to increase their capital; but this had been postponed, and with it the intention to appoint the Secretary (Mr. John Phillips) to a seat on the Board. They now, however, purposed carrying out their intentions; and the shareholders would be glad to know that Mr. Phillips would become a Director. He had served the Company honourably and faithfully, and, he (the Chairman) was sure, to everyone's satisfaction, for a period which was practically half-a-century. There was no single person on the directorate or the staff who would not be delighted to see Mr. Phillips on the Board. The application to Parliament would be made immediately. Since their last meeting, they had lost another colleague—Mr. G. K. Stothert; and there had been appointed in his place Mr. George C. Hewitt, a gentleman of experience in the coal trade, who, with his knowledge, would be of great assistance to them. The prices ruling in the coal market had occupied the attention of the Board a good deal of late. What with the high quotations and the low charges made for gas, he must tell the shareholders that, unless they could make more favourable coming contracts, they would be obliged to raise the price of gas. There were some figures connected with the progress of the Company which he should like to lay before the shareholders. In 1892, the price of gas was 2s. 10d. and 2s. 8d. per 1000 cubic feet; while to-day the Company were only charging 2s. and 1s. 6d. They had made during the past twelve months 87 million cubic feet more gas than in the previous year. In 1892, there were only 20 prepayment meters in use; whereas they had now no fewer than 20,640. He had always had confidence in the slot-meter system; and he believed it would still further extend, for he heard from landlords that a man who had once lived in a house fitted with a meter of this kind would not look at one which was not so furnished. The average consumption of gas per slot-meter was between 15,000 and 16,000 cubic feet per annum. Then, again, their cooking-stove department had made most satisfactory progress, as would be found when he said that in 1892 there were 2196 in use, whereas last year the number had increased to 39,390. He ventured to think that in a short time there would not be a family house in Bristol which did not have its gas-cooker. The comfort, convenience, and economy of such a stove in the summer months were such that they must appeal to the maximum number of householders; while the slot-meter was a great boon to the mechanic, for it enabled him to make for himself a hot cup of cocoa before turning out to his work early on a winter morning, and

without disturbing "the missus." Another feature of the Company's business was the day consumption of gas. In the year 1892, this stood at 475 million cubic feet; whereas last year the total had increased to 1250 millions. This would show the shareholders that the Company did not depend altogether on the night supply; indeed, he thought that eventually the day service would represent a greater consumption than the night. Another thing which showed that the electric light was not stamping out the Company's gas by its supposed brilliancy was the fact that whereas in 1892 they had 85 consumers per mile of main, at the present time they had 146. He thought the proprietors would agree with the Directors that the Company was a progressive one, and that its shares were not only an excellent investment for those who were looking for one, but that it also gave the best security that could be offered.

The DEPUTY-CHAIRMAN (Mr. Fenwick Richards) seconded the motion; and it was carried unanimously.

The retiring Directors (Alderman Dix and Mr. Fenwick Richards) and Auditor (Mr. H. Grace) having been re-elected, and the dividend recommended declared,

Mr. DALLORZO moved a hearty vote of thanks to the Chairman, Directors, Secretary, and staff, for their excellent services, and drew a parallel between the supply of Bristol and Birmingham, the respective prices of gas per 1000 cubic feet being 2s. and 2s. 6d. In Birmingham, the consumer, if he wanted a new cooker, had to pay 7s. per term until the purchase had been completed, or put up with a second-hand stove; whereas the charge for hire in Bristol for a new cooker was only a nominal one. This, he thought, was an excellent object-lesson against municipal trading. In Birmingham, the City owned the gas supply; whereas in Bristol it was in the hands of a well-managed, public-spirited Company.

Mr. WESTON STEVENS seconded the motion, which was carried by acclamation.

The CHAIRMAN having acknowledged the vote and thanked the proposer for his remarks,

The SECRETARY said the staff would appreciate the kindly things said of the way in which they discharged their sometimes trying duties. He might mention that when meeting recently a high gas official of a city larger than Bristol, this gentleman was astonished at the Bristol slot-meter results, which were far in excess of those obtained in his own place.

The proceedings then closed.

DERBY GAS COMPANY.

The Annual General Meeting of this Company was held on Friday—Colonel G. GASCOYNE, J.P., in the chair.

The SECRETARY (Mr. H. Bullivant) having read the notice convening the meeting, the report of the Directors was presented. They stated that in the year ending the 31st of December there had been a considerable increase in the consumption of gas; and that the prices obtained for residuals had, on the whole, been satisfactory. The profit on the year's working amounted to £36,619. To this must be added £10,242 brought forward; making a total disposable balance of £46,861. Of this amount the Directors appropriated £15,050 towards exceptional expenditure incurred during the year in modernizing the Litchurch and Cavendish Street works. These alterations are now completed and are stated to be working with most satisfactory results. After deducting this amount, and allowing for the interim dividend for the June half year, and interest on the debenture stock, deposits, income-tax, and bank interest for the whole year, there remained a balance of £16,435 available for distribution. The Directors recommended the payment of the standard dividend on the consolidated stock at the rate of 5 per cent. per annum for the half year ending Dec. 31, with an additional ½ per cent. for the whole year; making 5½ per cent.

The CHAIRMAN, in moving the adoption of the report and accounts, said the most important item in the capital account was that which represented the purchase of the Belper and Milford Gas-Works. In accordance with resolutions adopted after the last annual meeting, a Bill was passed through Parliament authorizing the purchase of the undertakings of these two Companies by the Derby Company; and both had since been carried on by Liquidators up to the present time, and would almost immediately be formally handed over to the Company, together with a satisfactory profit on the interim working. As from the 1st of January of the present year, the Belper and Milford works were being provisionally carried on by the Company; but their returns were not included in the present accounts. The amount paid for the purchase of the two undertakings was £22,100. In the revenue account the proprietors would find that £74,774 had been spent in the manufacture of gas. The main item, of course, was coal, which had cost £47,300; being an increase of £9000 over last year. This was due to the larger quantity carbonized, but also to the higher prices compared with 1907. The Directors anticipated slightly easier prices in coal; and it would no doubt be much lower in the unfortunate state of trade generally throughout the country but for the fact that they had the Coal Mines Regulation Act of last session to reckon with. No one could foresee the effect of this measure; and therefore it was impossible to forecast the future. In consequence of a much larger quantity of gas being required, the Board, acting under the advice of their Engineer (Mr. J. Ferguson Bell), found it necessary to reconstruct and modernize portions of the works, both at Litchurch and Cavendish Street. This had now been done; and plant and apparatus which had become obsolete had been replaced with more up-to-date plant. Much of this work had been done by the Company's own staff, employing local labour. A further great portion had been done by local firms; and the Board were pleased to be able to state that all the contractors had carried out their work in a highly satisfactory manner. All these alterations had been carried through without any mishap or accident; and the Directors and their Engineer were well satisfied with what had been done, and believed that the changes would prove to be remunerative and beneficial. The cost of the distribution of the larger quantity of gas produced increased by £2356, and had involved many renewals of mains and services. The proprietors would naturally want to know how these expenses were going to be met. They would notice in the report a statement that there had been a considerable increase in consumption of gas during the year. As a matter of fact, the quantity sold amounted to 868¼ million cubic feet, compared with 772 millions in the preceding year; being an increase of 96¼ millions. This, in a year of unfortunately bad trade, and with a very open winter, spoke well for the progressive nature of the Company's business. But it must not be forgotten that gas was now used in a variety of ways, and largely for heating, cooking, motive power, and in the preparation of various textile fabrics. The total amount received for gas last year was £96,432, which was a very great step towards the £100,000 which he hoped they would cover in that period. The meters of various kinds in use at the end of the year numbered 27,143; showing that they had obtained 326 new customers. The business in the sale of gas for power purposes also showed a considerable development; and he might inform the stockholders that, in order to meet the requirements of those who used gas-engines, the Company were prepared to do small repairs to gas-engines, so as to keep them in good running order and condition, and save the consumers the extra expense of having to send out of the town for small repairs to be done. Among the residual products, he drew attention last year to the value of coke as a smokeless fuel for household purposes and general use, and mentioned that special machinery had been erected to break and screen it to uniform sizes, so as to make it suitable for domestic use. As a result of this policy, he was glad to find the quantity sold in Derby during 1908 was very much larger than in any previous year; and its use seemed to be extending, as the receipts for this product showed an increase of £4000. The same could not quite be said of tar; for, unfortunately, coal-tar products had been much depressed, and at present there were not many signs of improvement. Sulphate of ammonia had yielded a lower price; but he was pleased to find that this important product seemed to be increasing in value. He hoped the results of the current year would show an advance upon those of the past twelve months. The proprietors would have noticed that the Directors had appropriated £15,000 towards exceptional expenditure; and that, after allowing for all other charges, there remained a balance of £16,435 available for distribution. The dividend would absorb £13,744; leaving a sum of £2691 to go to the next half-year's accounts—a satisfactory state of affairs.

Alderman NEWBOLD seconded the motion; and it was carried unanimously.

The dividend recommended having been declared, and the retiring Directors and Auditor re-elected, a vote of thanks was cordially passed to the Directors, Engineer, Secretary, staff, and employees, for their services on behalf of the Company during the past year.

The CHAIRMAN, in acknowledging the compliment, said their efforts as Directors would be of small value if they were not most zealously assisted by the very capable officials. In Mr. Bell, their Engineer, they had a man of high repute and rank in the gas profession; in Mr. Bullivant, they had a most competent and assiduous Secretary; and he could bear testimony to the loyalty and capability of their subordinates in the works and offices. Though the Directors exercised careful supervision over all matters, it was to the officials of the Company that its prosperity was in a large measure to be attributed; and they should be remembered in the vote.

This concluded the proceedings.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

The report which will be presented at the half-yearly meeting of the Bournemouth Gas and Water Company on Friday opens with the gratifying statement that the revenue continues to show satisfactory expansion, and the decrease in the price of gas to 2s. 9d. per 1000 cubic feet, which was effected as from Michaelmas last, has been fully justified. The scheme of co-partnership for the benefit of the Company's staff, approved by the shareholders at the last half-yearly meeting, has been cordially accepted by the officers and employees; and in the present half year a sum has been reserved in respect of the distribution which will take place in July next.

The accounts accompanying the report show that the total revenue of the Company for the past half year was £85,511, and the expenditure (including £574 15s. 6d. for the co-partnership scheme and expenses) £60,856; leaving a balance of £24,655 to go to the profit and loss account. The sum available for distribution is £32,998; and the Directors recommend dividends at the rates of 6, 7, and 14 per cent. per annum on the preference, "B" ordinary, and original shares respectively. After payment of these, there will be left £16,334 to be carried forward.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager, 22,703 tons of coal, 55 tons of cannel, and 302,105 gallons of enriching oil were used in the production of 381,954,000 cubic feet of gas, of which 336,307,364 cubic feet were sold and 346,654,264 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 14,299 tons; breeze, 1062 tons; tar, 218,484 gallons; sulphate of ammonia, 179 tons.

Opposition to the Eastbourne Gas Bill.—At the meeting of the East Sussex County Council last Tuesday, Major Lister moved that the Eastbourne Gas Company's Bill be opposed. He said the Council only asked the Company to agree to the insertion of clauses which had not only been accepted in other cases, but had been approved by a Committee of the House of Commons. The Council were asking nothing extravagant, but only that pipes should be laid at a proper distance from the surface. It was absolutely necessary, with the heavy traffic now on the roads, to see that pipes were not laid at an insufficient depth, with a consequent continual disturbance of the ground. The motion was carried.

PROVINCIAL GAS COMPANIES.

Gas in Increased Favour at Bury St. Edmund's.

At the recent half-yearly meeting of the Bury St. Edmund's Gas Company, the Directors reported that the output of gas had been well maintained. The prices of residuals, however, were still low, and they had not improved during the half year. The payment of the usual dividend of 10s. per share on the 1849 capital, 7s. 6d. per share on the 1859 capital, and 7s. per share on the 1879 capital, less income-tax, was recommended. The Chairman (Mr. F. C. Andrews), in moving the adoption of the report, said the Directors thought the balance-sheet for the half year very satisfactory. There had been a steady increase in the consumption of gas. The revenue account for the second half of 1907 amounted to £5753; but for the six months ended Dec. 31, 1908, it had gone up to £5820. To the profit and loss account £1717 had been carried, compared with £1617. The reserve fund prior to the payment of money due to the Corporation had reached £4000. It now stood at £2542. He thought it well to build up a good reserve fund, in view of impending expenditure to bring the retort-house up to date. He referred to the increased output of gas, which he said was more in favour for lighting, as well as cooking, and also heating by radiators in private houses. Mr. Floyd, in seconding the motion, alluded to the Company's strong financial position, notwithstanding the severe opposition with which they had for some years now had to contend. The report was adopted.

The Illuminating Power of Coatbridge Gas.

In moving the adoption of the report of the Directors of the Coatbridge Gas Company (see *ante*, p. 332) at the annual general meeting last Tuesday, the Chairman (Mr. James Johnston), after commenting upon the finances, as shown in the revenue and profit and loss accounts, explained that the items for repairs, maintenance, and renewals of plant were in keeping with those of former half years but that the Directors, acting on expert advice, would in future deal with depreciation in meters and cooking and heating appliances. Turning from the accounts, he said, as the shareholders were all, no doubt, aware, the Provisional Order which had been applied for with a view to lowering the present wasteful illuminating standard of the Company's gas had been opposed by the Town Council on the grounds that the proposal was one-sided and unreasonable, and that the Company's object was to increase the dividends to the shareholders and enhance the value of the undertaking. In his opinion, though the Council hinted at a purchase scheme, their sole aim was to lower the sliding-scale, which would have a most injurious effect on the management of the Company's affairs. If they succeeded in this, the Company might be forced to revert to the conditions at present in vogue; and should such a decision become a necessity, it would be detrimental to the interests of both consumers and shareholders. He concluded by moving that dividends be declared at the rate of 11½ per cent. per annum on the original stock, and 8$\frac{1}{10}$th per cent. per annum on the three issues of £10 shares. Ex-Provost Sharp, in seconding the motion, which was carried unanimously, said his views on the matter of the Provisional Order were in unison with those expressed by the Chairman. The retiring Directors and Auditor having been re-elected, Mr. Robert Adam moved a vote of thanks to the Directors and the Manager for their services, which had brought about the satisfactory results presented to the shareholders. He said he thought the Town Council were ill-advised in spending the money of the ratepayers by opposing an Order for powers similar to those which had been granted in several instances which he mentioned. The Chairman, in acknowledging the vote, said it was a question for the Council's judgment, from their own particular point of view, as to whether they were justified in offering opposition to the Company. They were entitled, as representing the ratepayers, to take what action they thought necessary in their interests.

Good Management Recognized at Grantham.

At the recent half-yearly general meeting of the Grantham Gas Company, the accounts presented showed a balance of £3904 to the credit of the profit and loss account, and out of this sum the Directors recommend that £2000 should be applied in payment of the maximum dividend of 5 per cent. per annum on the consolidated stock; that a further sum of £1000 should be placed to the credit of the reserve fund; and that the balance should be carried forward. The Chairman (Mr. John G. Thompson), in proposing the adoption of the report, said he was glad to know it was again a very satisfactory one, thanks to their able Manager (Mr. R. G. Shadbolt) for the way in which he had conducted the works. Not only was he highly economical in the manufacture of gas, but exceedingly skilful in its distribution to the public. The best thanks of the Directors and shareholders were due to him. During the past half year, the Company had not only earned the maximum dividend, but had also been able to add another £1000 to the reserve fund. As the shareholders were aware, an Act of Parliament was passed last session restricting the hours of labour among coal miners; and it was thought by those who were best able to judge—by experts in the manufacture of gas—that the measure would probably have the effect of raising the price of coal 1s. 6d. per ton. If this was so, it would affect the cost of the production of gas. Still, the Directors hoped at no very distant date—probably next July—to grant consumers a reduction in the price of gas. But when they did make one, they wished it to be permanent; they did not want to reduce the price, and raise it again in a year or two because coal had gone up. The Directors also proposed to carry out the suggestion made at the last meeting—to introduce the co-operative principle among their workmen. Mr. Shadbolt was now engaged in collecting statistics from other companies who had adopted this system; and he would shortly advise the Directors which would be the best scheme to introduce at Grantham. They hoped to be able to put the thing into definite shape by next July. Under the circumstances, it was considered that the best policy for the present was to still further increase the reserve fund. When this reached a certain amount, the Company were compelled by Parliament to give to the consumers the benefit of any further surplus. The report was adopted.

Continued Prosperity and Reduced Prices at Littleborough.

The ordinary half-yearly meeting of the Littleborough Gas Company was held on the 4th inst., under the presidency of Mr. J. C. Hudson, the Vice-Chairman. The Directors in their report recommended the declaration of the maximum dividend at the rate of 10 per cent. per annum (less income-tax). It was shown by the statement of accounts that gas sales amounted to £4501, compared with £4388 for the second half of 1907. The sale of residual products realized £1140, against £1162. The profit on the revenue account was £1432, and the disposable balance for the payment of dividends £2747. The working results for the half year showed that 34,854,600 cubic feet of gas had been made, representing an increase of 3¾ per cent., compared with the make in the corresponding period of 1907; and 3170 tons of coal were carbonized—the average yield of gas being 10,995 cubic feet per ton. The total quantity of gas made for the twelve months ending Dec. 31 was 66¾ millions, which constituted a record output. The Chairman, in moving the adoption of the report, congratulated the shareholders on the fact that increased gas sales were again reported, in spite of the general trade depression, and also that the financial condition of the Company was so sound. The charges for reconstructions and renewals had been exceptionally heavy during the past few years; but the works were now fitted with modern equipment. The improved working results and the extensive use of gas for other than lighting purposes had made practicable a reduction in the charges to the consumer. Factors militating against an earlier reduction, over which the Directors had no control, were the considerable increases in the price of coal, the depressed state of the residuals market, the increased rating charges, which now amounted to £600 per annum, compared with £280 ten years ago, and the difficulty of maintaining an increased total consumption in a district which but slowly developed, in face of the proportionate reduction of consumption caused by incandescent lighting, particularly in a manufacturing district. The Directors hoped that a reduction in price would lead to a still more extended use of gas for all purposes; and they had decided to lower their charges 2d. per 1000 cubic feet. The revised prices, according to consumption, were: For lighting, 2s. 6d. to 2s. 11d; for non-lighting, 2s. 3d. and 2s. 4d.; for engines, 1s. 9d. to 2s. 3d.; and an allowance of a cash discount of 2d. per 1000 cubic feet to prepayment meter consumers. The shareholders expressed satisfaction at the position of the Company, and the report was adopted. Thanks were accorded to the Directors, the Manager and Secretary (Mr. S. E. Halliwell), and the officials of the Company.

Good Increase at Malton.

At the half-yearly meeting of the Malton Gas Company on Monday last week, the Directors reported that a sum of £3323 was available for distribution; and they recommended a dividend of 6 per cent. for the half year ending Dec. 31, free of income-tax. This would absorb £1440, and leave £1883 to be carried forward. The sale of gas had been satisfactory; amounting to an increase of 7 per cent. compared with the corresponding period of 1907. In moving the adoption of the report, the Chairman (Mr. H. W. Pearson) said its most salient feature was the satisfactory increase in the consumption of gas, which had taken place mainly among the smaller consumers, who used prepayment meters. This was a very sound basis of the Company's business, as the small consumers were more to be relied on in permanence than the larger ones, the loss of one or two of whom made a serious inroad into their income. Another satisfactory feature of the half-year's working was that the dividend was being paid almost entirely out of the revenue. Referring to a complaint made, in the course of a discussion at a meeting of the Norton Urban District Council, of the inadequate supply of water to the Scarborough Road and the suburbs of Norton, owing to the Gas Company not furnishing sufficient motive power to the Northern Counties Electricity Supply Company, who had charge of the pumping, the Chairman pointed out that the complaining councillor was evidently oblivious of the fact that the Gas Company did not now supply the Electricity Company, though they used to do so, and that therefore they had nothing to do with the insufficient water supply. On the other hand, he might suggest that perhaps the reason for the insufficiency was that the Gas Company had ceased to furnish the power. The report was adopted.

Portsea Gas Company Acquire Fittings Business.

At the half-yearly general meeting of the Portsea Island Gas Company last Saturday, the report presented showed that, exclusive of the amount standing to the credit of the extraordinary renewals account (£6295), the profit and loss account showed an available balance of £40,184, which enabled the Directors to recommend the payment of full statutory dividends—viz., at the rates of 13, 12, 10, and 5 per cent.—on the various descriptions of shares and stock for the half year ended the 31st of December; leaving a balance of £22,252. The Directors stated that the half-year's expenditure had been very considerably increased by the unusual frequency of fires in the Company's coal-stores, arising from spontaneous combustion; by a settlement of a claim (£1180), on the recommendation of the Company's legal advisers, for the further pollution of a watercourse on the land adjoining the Hilsea works; and the surrender of the coke-yard at the Flathouse works, held under a licence from the Admiralty, which the Directors found it necessary to determine, owing to the exigencies of the public service. The revenue from the sale of gas, and from the rental of meters, cooking-stoves, and gas-fires had continued to increase, while the number of consumers had appreciably augmented. The general depression in trade and the mild weather had adversely affected the market for residuals, especially for coke, and no prospect of immediate improvement was discernible. The Directors considered it would be advisable to acquire the business of the Gas-Fittings Company, Limited. They reported that, under the supervision of the Engineer and General Manager (Mr. J. D. Ashworth), works and mains had been kept in good order. The revenue account showed that the receipts in the half year amounted to £114,098, and the expenditure to £96,332. The balance carried to the profit and loss account was £17,766, compared with £18,948 in the corresponding period of 1907. The quantity of coal and cannel carbonized was 56,687 tons, and 471,516 gallons

of oil were used, in the production of 710,884,000 cubic feet of gas, of which 646,499,500 cubic feet were sold. In moving the adoption of the report, the Chairman (Alderman Sir John Baker, M.P.) remarked that the Company had been fairly successful, in spite of their many unavoidable losses as detailed in the report. With regard to the proposed purchase of the business of the Gas-Fittings Company, the proprietors ought to be reminded that the Company was originally formed at a time when the Gas Company were not empowered by their Act to supply any fittings; and it was established to protect both the consumers and the Gas Company. A financial statement had been prepared on the matter by Mr. Edmonds, one of their Auditors. The Secretary (Mr. H. A. Stibbs) read a mass of figures from the prepared estimate of purchase. It was shown that when the Gas-Fittings Company was formed in 1882, with a capital of £1500, there was very little interest apparent to secure the shares; but the 25 proprietors had increased to 69. The amount required for the stock, plant, tools, and the purchase of the shares was £18,500. The Deputy-Chairman (Mr. R. E. Hellyer) seconded the motion, which was supported by Mr. A. W. Oke and others, and carried unanimously. The thanks of the proprietors were accorded to the Directors; and with the Chairman's brief response the proceedings closed.

SCOTCH RAILWAY COMPANIES & DEMURRAGE CHARGES.

Deputation to the Board of Trade.

There was given in last week's "JOURNAL" an account of the proceedings at a conference in Edinburgh of the representatives of the principal gas undertakings in Scotland, which was convened by Mr. W. R. Herring, of Edinburgh, to consider the proposed enforcement by the Railway Companies of demurrage charges and siding rents, &c. Mr. Herring then stated that Mr. H. J. Tennant, the Secretary to the Board of Trade, had intimated that he would receive a deputation on the subject; and another meeting was held at which the members of the deputation were appointed.

The conference decided that they had a right to plead for the total exemption of the traffic of gas undertakings from the imposition of the proposed charges and regulations, or, at any rate, that the period of detention of waggons should be subjected to the principle of average on the basis of the time allowance proposed in the regulations. It was resolved that a note of the conclusions arrived at should be sent to gas undertakings in Scotland other than those then represented; and Mr. Herring thereupon circularized all works having a make of over 50 million cubic feet of gas. Most of those not represented at the conference concurred in the conclusions arrived at. Inverness, however, stated that they received their coal by water; Paisley and Coatbridge said the matter did not affect them; and Galashiels remarked that they owned all their own waggons.

As arranged, the deputation waited on Mr. Tennant on Monday morning of last week. Those taking part in it were: Edinburgh—Lord Provost Gibson, Chairman of the Gas Commission; Bailie Bryson, Leith, Convener of the Works Committee; Mr. W. R. Herring, Gas Engineer; and Mr. J. M'G. Jack, Clerk. Glasgow—Bailie Montgomery, Chairman of the Gas Committee; Bailie Paxton, Deputy-Chairman of the Gas Committee; Mr. Alexander Wilson, Gas Engineer; and Mr. Middlemas, Assistant Town Clerk. Perth—The Lord Provost; Councillor Hamilton, Convener of the Gas Committee; and Mr. W. B. M'Lusky, Gas Engineer. Dundee—Mr. A. Wilkie, M.P.; Councillor John Reid, Convener of the Gas Committee; and Mr. A. Yuill, Gas Engineer.

Mr. PRICE, M.P., who introduced the deputation, remarked that they looked upon the crisis as serious, because by the amalgamation or combination of working arrangements which had been entered into by the three great Railway Companies, the people of Scotland were now entirely at their mercy. The deputation, therefore, looked to the Board of Trade to protect the interests of the public generally.

The LORD PROVOST OF EDINBURGH, who said that the deputation represented the gas undertakings of Scotland, pointed out that the question of the proposed railway demurrage charges, siding rent, &c., had been before a conference in Edinburgh, and after mature consideration those present were unanimously of opinion that the imposition of such charges and regulations would impose additional and unfair burdens upon the gas-consuming public, and render it both difficult and more expensive for them to fulfil their statutory obligations. They therefore pleaded for the entire withdrawal of the Railway Companies' proposals, so far as they applied to their undertakings, or, if the General Railway Acts of Parliament rendered this impossible, they pleaded most earnestly for their material modification and amendment on lines to be hereafter indicated. The statutory obligations upon the suppliers of gas, necessitating as they did the continuous supply and the continuous manufacture of gas day and night, Sundays, week days, and holidays, also necessitated continuous and regular deliveries of coal; and the undertakers were in the habit of ordering this in accordance with their known requirements. From causes over which the gas undertakings had no control, the regular daily requirements had not been delivered with such uniformity as to enable them to discharge their statutory obligations without having a reserve of coal on rail, and using from this reserve during the periods of irregular delivery, which might be said to be chronic, primarily owing to the manipulation of the traffic by the Railway Companies, and secondarily owing to the collieries loading irregular quantities from day to day. The irregular quantities loaded by the collieries was alleged by them to arise wholly from the irregular supply of waggons by the Railway Companies to the collieries for such purposes. From whatever cause, however, this might arise, the fact remained that the deliveries did vary from day to day, and during each particular week, to an enormous extent. Bearing in mind the fact that gas-works must use a regular but known quantity of coal per day (varying in extent with the season of the year), irregularities of delivery must result at one time in shortage and at other times in excess; and experience proved that irregular deliveries from some or all of the causes mentioned inevitably resulted in a great excess of delivery following a previous shortage, with the result that the waggons could not be cleared as rapidly as they would be if the daily requirements were delivered as ordered. Seeing, therefore, that the undertakers had no control whatever over the amount of coal delivered to their works in excess of their daily requirements, they were strongly of opinion that they had a right to plead for the total exemption of their traffic from the imposition of the proposed regulations. The undertakers did not argue that the time allowance for discharging waggons was insufficient under proper conditions. On the contrary, they could prove that, on the average, they did discharge the waggons within the period stipulated, when their orders were executed as given. As, however, the conditions of delivery were not within their sphere of regulation, they felt it would be a great hardship to be penalized in consequence of the actions of others whom they could not control, and primarily by the very parties who caused the irregular deliveries, and who were in the habit, particularly during periods of congestion, and trades and other holidays, of giving the passenger traffic preference over minerals. The Railway Companies' own manipulation made it impossible for concerns like gas undertakings, that required to continue operations irrespective of all holidays, to comply with such regulations. If, owing to general railway enactments or from present statutory obligations, the Railway Companies were not permitted to exempt the gas undertakings from the effect of the regulations altogether, then they felt that a fair and reasonable compromise would be to introduce the principle of averaging as a basis of settlement. They were convinced that, in the ordinary course of their business, the waggons were not detained on the average as long as the present regulations permitted, excepting perhaps at the mid-winter season, when owing to the Christmas and New Year holidays on the one hand, and the necessity of producing gas at the maximum quantity at that season of the year, on the other, a larger amount of traffic than was normal must be on rail to tide over the period of the stoppage of the collieries. They were, however, on the basis of averaging, prepared to come under such an obligation. A daily record of waggons on sidings must be kept under any circumstances; and this record would enable the principle of averaging to be easily applied. Dealing more specifically with the proposed demurrage charges, the undertakers were of opinion that they were greatly in excess of any possible loss the Railway Companies suffered as a result of the use of their waggons under demurrage. The average carrying capacity of Railway Companies' waggons reaching the Edinburgh works was 8 tons 10 cwt.; whereas the Railway Companies by their regulations suggested that 16 tons was the average carrying capacity of their waggons, and for which they charged a minimum of 1s. 6d. per day. Some of the gas undertakings had contracts now running for the hire of waggons, such hire including also upkeep and full responsibilities for repair. The rates that were being paid by them varied from 4½d. per day for a 10-ton waggon to 5½d. per day for a 12-ton waggon; whereas the Railway Companies were demanding a minimum of 1s. 6d. per day on all waggons below 16 tons. Then likewise with regard to siding rents, the Railway Companies proposed to charge an equally exorbitant amount—viz., 6d. per waggon per day—whereas, allowing £50 per acre per annum for the land and 10 per cent. for interest on capital and maintenance of sidings, including an allowance for rates and taxes, 1d. per day per waggon would be ample allowance for siding rents. In conclusion, the undertakers had become acquainted through the public Press with the official statement issued by the Board of Trade as a result of the conference held the previous Friday; and they felt that their position was by no means made easier, if the reports in the public Press truly represented the lines upon which the Railway Companies were intending to assess the liability. They therefore felt the utmost concern for the public interest in connection with these regulations, and pleaded most earnestly for the mature consideration of the points set forth, and the explanations that might be given by the managers of the respective undertakings.

Mr. ALEXANDER WILSON said that, taking into consideration their statutory obligations, and the necessity for maintaining a full supply of gas for all purposes, the Railway Companies recognized that gas undertakings should have a reserve of waggons on hand to keep the works going and allow for difficulties in transport. If the coals, &c., were delivered in a regular manner, this reserve could be kept at a minimum; but when they found differences of delivery amounting to several hundreds of tons per day within short periods at a single works, and their reserve at a works varying within a few days from less than 50 to 300 waggons, it was impossible to unload the waggons in a stated period, as all the time this irregularity of delivery was going on the works were using coal in a normal and perfectly steady quantity. They had trouble and difficulty in getting the Railway Companies to give even this faulty service; and, instead of losing on the holding-up of some of their waggons for a short time, the Companies would, by making these irregularities more pronounced, be enabled to get a considerable addition to their incomes. This being the case, he thought the owners of gas-works should be exempted from the proposed charges, or at least the charges should only be made on the average time the whole of the waggons were retained. With regard to the amount per day proposed to be charged for demurrage, the figure of 1s. 6d. per day per waggon was out of all proportion to the value given or the cost of the waggons to the Companies. His Committee were at present taking in tenders for waggons; and he found that good 10-ton waggons could be obtained on the hire-purchase system for an annual payment over ten years of between £5 and £6. Taking 300 days per year, this gave a charge of less than 5d. per day; and, seeing there were no wear and tear expenses while the waggons were standing, this figure should be amply sufficient to cover all outlays, and, if exceeded, would only be a standing temptation to the Companies to work their traffic to the detriment of the gas-works and in their own interests through extra demurrage charges. The total quantity dealt with annually by the Glasgow Gas Department was over 1,200,000 tons; and the probable number of loaded waggons handled was over 200,000 each year. If only one day were charged at the proposed rates on a third of these waggons, the annual cost to the gas consumers of Glasgow would amount to £5000; and when they knew that these charges would be brought about, not by the action of the Corporation, but mainly through the deficiencies of the Railway Companies, he felt sure Mr. Tennant would consider that the matter required very serious attention.

Mr. A. WILKIE, M.P., speaking on behalf of the Lord Provost of Dundee, said the deputation were pleading for equity and justice. No one desired to put the Railway Companies in an unfair position; and if there had been undue detention of waggons, let the guilty be punished. Why, though, should the innocent be punished? Without committing the deputation to the statement, he said he hoped these combinations would go on until the combination would become the country's combination, when traders and public alike would get fair play.

Mr. TENNANT replied that the Board of Trade were fully alive to the great interests involved, and to the distinctly important nature of the questions which they had to try to solve. They were keen to help the deputation, because they felt that, so long as this kind of doubt and dubiety hung over the situation, the trading interests involved would be severely prejudiced. A Briton hated nothing so much as anything in the nature of hesitation or doubt. The Board would like to get the matter settled once for all; and he was particularly anxious that it should be settled without recourse to the further stages of arbitration with each particular set of traders, involving an infinity of time and costing a large amount of money. It would be outside his province to express an opinion upon any part of the case; but he was rather doubtful that the suggestion about averages would work out satisfactorily. As to the complaints regarding an inadequate and irregular supply of waggons, he could quite understand that such a position must be most harassing, and almost paralyzing, for a trader; but he pointed out that under this scheme of hastening the dispatch of waggons, the chances were that the position would be materially remedied. He was not altogether sure that a certain amount of odium had not been cast upon the Railway Companies for having in an unguarded moment "let the cat out of the bag" by saying that they were going to make money out of the scheme. They had not really meant this. The money they were going to make was really in the nature of a saving by using their waggons oftener. He thought this was a legitimate way of saving; and if only traders were to get an increased dispatch, all were the gainers, and he did not think they should grudge the Railway Companies the small pecuniary advantage they might then obtain. The fact that the undertakings represented had to produce gas up to a certain definite candle power, or were under other statutory obligations, could hardly, he thought be seriously considered as a reason why they should not have to conform to obligations to which other traders had to conform. He could hardly think that the one thing meant the other; and the suggestion reminded him of the Member of Parliament who, because members were allowed to cross the street on the wrong side going down to their duties, thought they should enjoy a similar advantage going home. Of course, the Board were alive to the importance of the gas undertakings; and it would be a great public disadvantage if anything should occur to handicap them. The Board, therefore, were extremely anxious to try to settle the difficulty in the best interests of all concerned, and with as much expedition as possible. He did not think he could say more. He was waiting the response of some gentlemen who saw him the previous Friday as to whether they would be able to bind their friends in the same industry. It would be difficult if they were not able to do so, because he did not think the Railway Companies could be expected to agree to such a solution unless every one could bind his neighbour in the same trade. He hoped that any agreement the present deputation came to with him or with the Railway Companies would be binding on all the gas undertakings.

The LORD PROVOST OF EDINBURGH: Those represented here would undoubtedly be bound.

Mr. TENNANT: Of course, there are some gas companies.

Mr. W. R. HERRING: We are here to represent the gas companies as well as the corporations. It may be taken that 90 per cent. of the Scottish gas undertakings are in municipal hands.

Mr. TENNANT: I think it is important that this deputation are able to bind the few gas companies there are, and certainly able to bind all the municipal gas undertakings. I do not think you would expect me to give any further indication of what is running through our minds, because we do not want to prejudge the question. But I trust our efforts may be crowned with success.

Mr. PRICE hoped Mr. Tennant would give careful consideration to the suggestion about averages.

Mr. WILKIE asked if the Railway Companies would meet the gas undertakings in the same way as they were to meet the traders.

Mr. TENNANT: I think that would be the wiser plan.

On the motion of the LORD PROVOST OF PERTH, a vote of thanks was accorded to Mr. Tennant.

Payment for Gas Used in Non-Provided Schools.

At the meeting of the London County Council last Tuesday, the Education Committee presented a report on the subject of the method of paying the gas accounts for non-provided schools. It set forth that the managers of these schools are refunded their expenditure in respect of cleaning, warming, and lighting, subject to certain deductions. The gas accounts are at present paid by the managers. In the case of Council schools, there is an arrangement by which the gas companies render complete quarterly accounts for all schools in their respective districts, and cash discounts of 5 per cent. are allowed, in the case of four companies, and 4 per cent. in the case of another company. The Committee stated that if this arrangement were applied to non-provided schools, the discount could be obtained in respect of them. They are accordingly making arrangements for the accounts for gas for these schools to be rendered direct to the Council, on the understanding that the cash discount is allowed, and also for the necessary adjustments to be made in the managers' claims for cleaning. The report was received without debate.

Portsea Island Gas-Fittings Company.—The half-yearly meeting of this Company was held on Saturday. Alderman Sir John Baker, M.P., presided, and after the declaration of a dividend of 6s. per share and a 6s. bonus, unanimous assent was given to the transfer of the business to the Portsea Island Gas Company, to which reference was made at the half-yearly meeting of shareholders of that Company, as reported elsewhere.

DUBLIN CORPORATION AND ELECTRICITY SUPPLY.

Financial Position of the Undertaking.

Towards the middle of September last year, the Corporation of Dublin passed a resolution requesting the City Treasurer (Mr. E. W. Eyre) and the City Accountant (Mr. J. P. Kerrigan) to inquire into, and report to them on, the general financial position of the Corporation electricity undertaking; to detail the names, position, and salaries of all employed thereon; and to refer in the report to the original estimates of Mr. Robert Hammond and the various promises made by the Lighting Committee in regard to extensions, and show how far they have been materialized. The report, which goes fully in the subject, has now been published; and we give below some extracts from it. It should be mentioned that it is not the production of both of the gentlemen named; for, unfortunately, Mr. Kerrigan was not able, through illness, to assist his colleague. He, however, approved of Mr. Henry Mangan, who has charge of the electric lighting accounts, acting on his behalf; and his signature follows Mr. Eyre's at the end of the report.

The reporters commence by saying they have first indicated the position of the undertaking up to the 31st of March, 1908, which was the last completed year of its working, as disclosed by the accounts. They remark, however, that there are some considerations which must be borne in mind when reviewing this position. While they are free to admit that, in the course of the several years' working, it would have been prudent, before any alterations of price were made—always in the direction of concessions to the consumers—to have more carefully calculated the financial effect, they say it must not be forgotten that in the foundation of a great undertaking of this kind its ultimate profit-bearing capacity could only be created by concessions of rates for current which would secure the citizens' support. They point out that "the Lighting Committee had in this to contend with a Company which had for many years enjoyed a monopoly for the supply of light in the city of Dublin and its suburbs;" and they conceive it to have been essential to the final successful development of the undertaking "that the price charged for electricity should at all events approximate to a rate which could compete with gas." They also feel bound to point out that the new undertaking started in 1903 handicapped with an unproductive capital expenditure of £58,407 on the old Fleet Street undertaking. This, they say, was a legacy which it might very fairly be argued should not be taken into consideration in an analysis of the present financial position of the new undertaking. They think, however, that, as it forms a portion of the indebtedness charged in the electric lighting account, they cannot ignore its existence; and they have therefore treated it as part of the capital of the new scheme.

Another fact which has materially affected the financial results of the scheme is the very considerable amount of capital sunk in the laying of mains, at the initiation of the undertaking, in streets which have provided few consumers, and where, consequently, the capital so expended is practically unproductive. It appears that there are no less than 35 streets in which there is only one consumer in each. In a few cases this consumer uses a very substantial amount of current, and the extensions in such cases have been made to meet a profitable demand; but in the remaining cases the mains were laid on the original system, with, so far it appears, little response from the residents. On the other hand, a supply is available from cables laid in 235 streets in which a very large extra supply can be given without further cable extensions, and without additional capital expenditure.

One other important consideration must be noted—viz., the revolution in the cost of electric lighting which marks the year ended March 31, 1908. It was in that year that the metallic filament lamps came into use, with the effect of saving consumers more than 50 per cent. of electric current, and materially lowering the income of the Committee to such an extent that in the current year the reduction is hardly balanced by additional customers. The reduced cost, however, should, the reporters consider, give an enormous impetus to the Committee's trading; and it points with encouragement to the future of the undertaking. At the same time, prices should, they think, be adjusted to the temporary strain, which "should not involve the taxation of the many that a few might reap an advantage;" and they say that under no circumstances should an alteration of price be made "without the fullest information as to the financial effect of such alteration." They have, however, dealt further with this question in the latter portion of the report.

Turning to the figures, the accounts of the undertaking for the year to March 31, 1908, which are given in full in an appendix, show as follows:—

Debit balance on year's working	£4,652
Add debit brought forward	48,162
Together	£52,814*
Expenditure of 1891 and 1892, before the station began working (in round figures)	1,200
Total	£54,014
Total contributions from rates to March 31, 1905 (since which date no rates have been assessed for electricity purposes)	48,028
Leaving a further sum to be provided out of rates on March 31, 1908, of	£5,986

The depreciation fund account stood on March 31 last at £1333. The capital expenditure up to that date had been: Old undertaking, £58,407; new one, £468,283—total, £526,690. The total amount of loans then received was £491,747, of which there had been repaid £91,787; leaving £399,960 remaining due. The balance-sheet shows an excess of liabilities over assets of £5986; being the amount to debit of the rates account on March 31 last. Of this debit, provision was made in the estimates for the current year of £3767; so that the balance not provided for is £2219. The actual provision made in the estimates resulted in an estimated debit balance on March 31, 1909 (which it had not been

* This is the total debit balance on the working of the undertaking since Jan. 1, 1893, and is carried to the rates account.

considered necessary to provide for out of the rates) of £868; leaving a total estimated debit of £3087 unprovided for in the current year's estimates. As to the year's working, the loss shown is £4652; and the loss in the previous year was £1720—showing an increased loss for the year of £2932. This is explained to be due to increased charges on net revenue.

Dealing with the increased expenditure on revenue account, the reporters show that the total cost of coal in the year covered was £10,746, compared with £6127; showing an increase of £4119. This was accompanied by decreased efficiency, as shown by the following figures:—

	Coal. Tons.	Units Sold.	Units Sold Per Ton.
March 31, 1907 . .	12,480 ..	3,280,751 ..	262·8
March 31, 1908 . .	15,576 ..	3,875,675 ..	248·8

These figures show a drop in efficiency of 5·32 per cent. The reporters say this is but very slightly due to loss in distribution, which shows an increase of only 0·5 per cent. The City Electrical Engineer furnished an explanation in reference to the decreased output per ton of coal used.

The reporters next deal with the subject of salaries, the total of which charged to the working account is £5057. This is brought up to £5838 by proportions of salaries of permanent officials charged to works repayable (£308), and salaries charged to loans account (£473). This is exclusive of the salary of a non-permanent official (£468) which brings up the total to £6306. The above-named sum of £5057 represents a cost of 0·313d. per unit. With regard to the £473, it is stated that the City Accountant wrote to the Electrical Engineer last May, pointing out that the charging of salaries of permanent officials to loans account should in future be discontinued. The Electrical Engineer objected to the change, and brought the matter before the Lighting Committee, who approved his objection. The reporters say that as the undertaking has now gone beyond its initial stages, the practice, if not actually unsound, is inadvisable.

The reporters next deal with the services rendered by other departments, the renewal of meters, and the outstanding accounts and bad debts. Coming to the depreciation account, to the credit of which there is a sum of £1333, the reporters say it was apparently intended originally to set aside an annual sum for depreciation; but, no doubt, such provision has for some years been considered unnecessary in face of the heavy annual repayments of capital, and the ultimate disappearance, in a comparatively short period, of the debt, which in an ordinary commercial concern of the kind would stand as a permanent liability. They think that as this fund is not intended for the purpose for which it was originally created it should be realized, and partly applied to cover an excess expenditure under the old undertaking of £644. The small balance left might be applied to the repayment of old loans. In place of an annual appropriation for depreciation, however, they consider that something should be set aside each year to the renewals and suspense account, but not invested, for a few years at least, so that it might be utilized as working capital. A renewals suspense account becomes of considerable importance in cases where, as in Dublin, an equated period has been given for the repayment of a loan to cover works of varying rates of depreciation. Before passing from the accounts for the year ending the 31st of March last, the reporters draw attention to certain technical alterations which have been carried out in the form in which they are presented, which render them more conformable to the requirements of the Board of Trade and to modern accounting practices.

After a few remarks on the delay in the publication of accounts, the reporters say they apprehend that probably a more comprehensive view of the financial progress of the undertaking may be obtained by giving, in addition to the figures disclosed by the balance-sheet to the 31st of March, the corresponding figures for the four preceding years. They have accordingly set these out in detail in an appendix. At the outset of the report, they referred to the exceptional difficulties with which the Lighting Committee had to contend in the earlier years of the undertaking; and they say these should not be lost sight of in any consideration which is given to the financial results of each year's working. The figures show that so long as normal conditions prevailed the excess of expenditure over income was reduced from £12,842 in 1904 to £1720 in 1907; while the capital expenditure went from £373,090 to £491,172. During the year, however, the metallic filament lamp came into use. It reduced the cost of light to the consumer by over 50 per cent., and began to affect the income of the undertaking. This, with an exceptional rise in the price of coal in that year, resulted in the excess of expenditure over income of £4652 already referred to. The percentage of surplus of income over expenditure, before providing for the repayment of principal and interest, was: In 1904, 1·72 per cent.; in 1905, 4·58 per cent.; in 1906, 4·75 per cent.; in 1907, 4·77 per cent.; and in 1908, 4·20 per cent. In the electricity concerns of public companies, the average set aside for depreciation and reserve is 1·60 per cent. of their capital; and if this provision is deducted from the surplus income over expenditure, the trading result would leave a balance available for the shareholders of 0·12 per cent. in 1904, 2·98 per cent. in 1905, 3·15 per cent. in 1906, 3·17 per cent. in 1907, and 2·60 per cent. in 1908.

When later on the reporters are dealing with the question of the probable effect of the proposed further capital expenditure, they include charges which they have referred to as elements to be taken into account in any calculation of profit earned; and they consider it is right to say that the preceding figures would be slightly reduced if these charges, which are debited against the future profits, had been brought into account in the periods above dealt with. They allude to salaries charged to capital, sundry services by officials of other departments, water supply, &c.

The number of units sold to private consumers by meter increased within the period the reporters are dealing with from 857,796 to 2,720,226, which they say indicates a fair record of progress. When they come, however, to the calculation of the cost per unit (eliminating the first experimental year), it would appear that the price obtained per unit for total supply, public and private, was less than the total cost, including charges for principal and interest on loans. If, however—again treating the concern on a trading basis—the repayment of capital and interest is eliminated, and a depreciation and reserve fund of 1·60 per cent. is substituted therefor, with the object of finding the profit per unit left for shareholders, the figures work out as follows:—

	Cost per Unit. d.	Price Obtained per Unit. d.	Provision for Depreciation per Unit. d.	Balance Available for Dividend per Unit. d.
1905 . .	1·665 ..	3·306 ..	0·598 ..	1·043
1906 . .	1·517 ..	3·111 ..	0·562 ..	1·032
1907 . .	1·353 ..	2·891 ..	0·538 ..	1·000
1908 . .	1·613 ..	2·870 ..	0·504 ..	0·753

As a comparison with results obtained elsewhere is instructive, the results of the working of the electrical undertakings of several other local authorities for the last financial year have been tabulated in an appendix. The general features of the comparison may be summarized as follows:—

	Average of 28 Cases.	Dublin.
Percentage of gross profit to capital . .	6·76 ..	4·20
Percentage of sinking fund to capital . .	2·71 ..	2·60
Average cost of generation, distribution, and management, per unit	1·19d. ..	1·61d.
Average price obtained per unit—		
Private consumers	2·73d. ..	3·26d.
Public lighting	1·67d. ..	1·93d.
Total supply	2·55d. ..	2·87d.
Load factor	17·54 ..	13·47

Having offered some remarks on these figures, the reporters say the points of difference between the average results of the undertakings dealt with and those of Dublin may be summarized as follows:—

The Dublin surplus of income over expenditure, before providing for principal and interest, was	£21,420 14 8
If the load factor were increased from 13·47 to the general average of 17·54, an increased output of 1,168,621 units would result, which, at 1·26d.—the difference between the price obtained for the total supply (2·87d.) and the costs of generation, &c. (1·61d.)—gives, as representing the difference in the load factors, an increased revenue of . . .	6,135 5 2
If the costs per unit were reduced from 1·61d. to the general average of 1·19d., a further increase of revenue would result—viz., 5,044,296 units at 0·42d.; the difference in costs being represented by a sum of	8,827 10 4
	£36,383 10 2
A reduction from the price of 2·87d. to the average price of 2·55d. would cause a decrease of income—viz., 5,044,296 units at 0·32d.; the difference in price being represented by a sum of	6,725 14 6
	£29,657 15 8
This surplus, resulting from the hypothetical application of the general conditions to the Dublin undertaking, would represent a percentage of 5·8 upon the average capital expenditure—viz. . .	£508,932 0 0
But the assumed surplus would give the average percentage of gross profit—viz., 6·76, upon a capital of only	438,713 0 0
There is thus disclosed, as a final result, a comparative over-capitalization of	£70,219 0 0

It is pointed out that the greater portion of this is accounted for by the now unproductive expenditure under the old undertaking—viz., £58,407; and a further cause of over-capitalization is, as already remarked, the laying of mains in certain districts which have not yet proved remunerative.

In an appendix are given estimates of the results of the working of the undertaking for the four years ending March 31, 1912; and in another are given details showing how the estimated capital expenditure at the end of each year is arrived at. These figures form the basis of the charges for principal and interest on loans, particulars of which are to be found in another appendix. The figures for the current year are taken from the estimates; while those for the succeeding three years are based upon data supplied by the City Electrical Engineer. Taking the respective consumptions for the three years at the uniform prices of 3·733d. for private lighting, 1·25d. for power, and 1·9d. for public lighting, and the works' costs at an average of 1·35d., while the principal and interest charges vary in proportion to the capital expenditure, the following results appear:—

Year to March 31, 1910, a deficit of. . . .	£448 6 7
,, ,, 1911, a surplus of . . .	681 2 11
,, ,, 1912, ,, ,, ...	3542 14 10

After some further remarks on the estimates, the reporters say the additional charges they consider necessary to put the undertaking upon a sound financial basis would be met by the following increases in the price per unit for private lighting: Year to March, 1910, 0·674d.; to 1911, 0·550d.; and to 1912, 0·351d. To meet the same charges, an average increase in price for the three years of 0·517d., or almost exactly ½d., per unit would be sufficient. This would be equivalent to an increase of 13·3 per cent. upon the present average price; and there remains the prospect of a reduction of 0·15d. per unit at the end of the three-year period, as, according to the estimates, the increase then required over the present price would be only 0·35d.

In view of the state of affairs shown, the reporters recommend that the price for private lighting should be raised by not less than ½d. per unit; and that the Lighting Committee should at once consider the advisability of a further increase, at least for the coming year, of (say) ¼d. Their estimate shows that, to meet the requirements of the year, an increase of 0·674d., which is not far short of ¾d., is necessary. They also think that the Lighting Committee should review their decision to reduce the power rate from the 1st of April next, and consider the question of charging a minimum power rate of 1½d., in its bearing upon the development of local industries. The necessity of any longer tempting new customers by a concession of 25 per cent.

reduction on their first year's account is a question which, in their opinion, the Lighting Committee should most carefully consider. This allowance amounts to about £1000 per annum.

The reporters, it will be remembered, were requested to refer to the original estimates of Mr. Hammond, and to the various promises made by the Lighting Committee in regard to extension, and how far they have been realized. As to the various promises of the Committee, they can only trace through their reports several expressions of satisfaction at the progress of the undertaking, and assurances of their belief in its ultimate development into a valuable property for the citizens. In assessing the value of these assurances, they say it must not be forgotten that the Committee were doubtless arguing rather from the rapid increase of consumers and the satisfactory addition to their revenue than from the exact relation which such figures bore to the capital expended. They consider the Committee were perfectly justified, therefore, in expressing satisfaction with the results for which they were responsible.

With regard to Mr. Hammond's scheme, the reporters give his estimate of the financial results as follows:—

Estimated capital expenditure, Pigeon House scheme	£254,500
Estimated income—	
Private consumers, £28,500; public lighting (less carbons, &c.), £9000; meter-rents, £1000	£38,500
Estimated cost of generation, distribution, and management (excluding carbons, repairs, &c., for public lamps)	16,531
Estimated gross surplus before providing for principal and interest on loans	£21,969
Charges for principal and interest (not set out by Mr. Hammond) on loan of £254,500, as for the year to March, 1906 (the first year in which the estimated output was reached)	15,390
Balance, representing surplus	£6,579
Deduct charges for principal and interest, not estimated by Mr. Hammond, on old loans of £86,547, for the year to March, 1906	5,061
Net surplus, according to original estimate	£1,518
Estimated units sold—	
Private consumers	1,520,000
Public lighting	1,125,000
Total	2,645,000
Total cost per unit for generation, distribution, and management, &c.	1·5d.
Average price—	
Private supply	4·5d.
Public lighting	1·9d.

The reporters remark that the conditions have so materially altered since the date of Mr. Hammond's estimate, nine years ago, that a comparison with present-day results can only be given in general terms. He proposed a gross plant capacity of 3000 kilowatts, while the gross capacity of the existing plant is 6000 kilowatts, with an output last year of 3,876,000 units, against the original estimate of 2,645,000 units, and an anticipated output within three years of 6,410,000 units, which is being steadily approached. It is, however, to be noted, that the original estimate shows a net surplus of income over expenditure of only £1518, when the charges for principal and interest on the old loans are taken into account. Further, owing to extensions of mains and sundry alterations and extras, which did not include any increase in the capacity of the generating plant, the expenditure on the Hammond scheme eventually reached a total of £316,405. As a result, though the estimated output was reached in the year ending March, 1906, and a total consumption of 2,840,225 units attained, increased charges for principal and interest on a supplemental loan of £50,700 had then to be met. These charges amounted to £3562, and contributed to the production of the deficit of £4229 for that year. It is pointed out, however, that the average price for the private supply had been reduced to 3·765d. per unit. Had the 4½d. rate been maintained, even after making due provision for principal and interest charges on the balance of excess expenditure (£11,205) not covered by the loan of £50,700, a small surplus of some £400 could still have been shown. But the reporters say that the eminently satisfactory result has to be recorded that the cost of generation and distribution, &c., estimated at 1·5d. per unit, which at the time was considered by some to be too low a figure to be reached in Dublin, was practically attained in the second complete year of working, which ended in March, 1906; the costs then being 1·517d. per unit. It was even reduced to 1·35d. in the year ending March, 1907, and, under Mr. Hammond's estimate, would have been last year also but for the exceptional increase in the cost of coal. Finally, they point out that, while the charge for public lighting remains at the original low figure of 1·9d., the estimated average price for the private supply has been reduced from 4½d. to 3·268d., which represents a reduction of over 27 per cent. Had the estimated price been charged last year, assuming that the private consumption remained unaltered, the income would have been increased by £13,964, and the deficit of £4652 replaced by a surplus of more than £9000.

In view of the length of their review of the financial position of the undertaking, the reporters briefly recapitulate their main suggestions, as follows:—

1.—Certain additional charges should, in future, be debited to the electricity revenue account: (*a*) Proportions of salaries of permanent officials hitherto charged to capital account; (*b*) cost of water supply; (*c*) proportions of salaries of some officials of other departments, &c.; (*d*) renewals of meters.

2.—Provision should be made by way of sinking fund for a reserve to meet part cost of renewals of machinery, &c.

3.—Provision should be made to earn a moderate margin of profit, which should be available to eliminate gradually the balance to debit of rates account, as well as the cash overdraft, and eventually to recoup the rates the expenditure thereout in previous years.

4.—To meet the additional charges and provisions above referred to, owing to the great reduction in the cost of lighting effected by use of metallic filament lamps, an increase of price is necessitated: (*a*) A minimum average increase of ½d. per unit for private lighting is required for the three years ending March, 1912. Taking the coming year alone, a higher figure is required; and the advisability of an increase of ¾d. per unit should be carefully weighed by the Lighting Committee, who at the same time should deal with (*b*) the question of a general simplification and readjustment of prices. They should further reconsider (*c*) the proposed reduction of power rate to 1½d., (*d*) the allowance of 25 per cent. discount for twelve months to new consumers, and (*e*) the allowances of ½d. per unit, or 7½ per cent. discount, where power and lighting supplies are combined.

5.—The collection of outstanding accounts should be enforced by more prompt and drastic procedure, and the collectors should be fully empowered to carry out such measures.

6.—In order to attain the maximum output in a much shorter time than three years, the resources of modern advertising should be fully utilized, and canvassing should be carried out in the most thorough and systematic manner by expert methods.

7.—To ensure a high standard of efficiency of the staff of the department, positions other than those of Engineers should be filled by competitive examination.

8.—With regard to expenditure, the utmost care should be exercised in connection with the purchase of coal, extensions of mains, and extensions of public arc lighting.

9.—As to the annual accounts, in addition to the alterations already carried out, an analytical and comparative summary should be shown in future. Accounts should be published at an earlier date; and the various departments concerned should be required to supply to the Accountant's Department within a reasonable time—say, by the end of May in each year—the materials necessary for closing the books.

10.—It would be desirable to exempt the Lighting Committee from the regulation governing the constitution of other Committees, and provide for greater continuity in the service of members on it.

The report is accompanied by ten appendices.

SOUTH METROPOLITAN COMPANY'S RATING APPEALS.

Further Reduction by the Auditor.

At the Woolwich Union Offices, last Thursday, Mr. H. D. Gordon, one of the Local Government Board Auditors, continued his investigation of the accounts of the Union for the year 1907-8. On this occasion, however, only a brief reference was made to the appeal of the South Metropolitan Gas Company for a surcharge against the Guardians because they had paid out of the rates, to Messrs. Dinwiddy and Sons, a considerable sum which was disallowed as costs against the Company after the latter had unsuccessfully appealed against the valuations put upon their properties. At the previous hearing, Mr. Gordon had stated that up to that point he had decided to reduce Messrs. Dinwiddy's bill by £127; but Mr. Pasmore, for the Company, argued that a reduction of £10 in respect of 278 letters charged at 5s. each was insufficient. He asked for £30, and promised to point out later on specific charges for work which had already been paid for in the 15s. per cent. Messrs. Dinwiddy received on all the property they valued before the last quinquennial re-assessment.

Last Thursday, Mr. Conrad Dinwiddy said that since the previous hearing his firm had been making inquiries of various solicitors as to the price charged for letters, and found that 5s. for every letter was above the average. He contended, however, that more than 150 of the Woolwich letters were special, and should be allowed at 5s.

The Auditor said he had determined to take the whole of the letters as of one type, and allow 3s. 6d. each for them. This would increase the original disallowance of £10 to one of £20 10s. Other matters in this application for surcharge must stand over till a future meeting.

The Electric Lighting Question at Finchley.—Opposition to the proposal of the Finchley District Council to spend £2200 in arc lighting is becoming stronger. At the last meeting of the West Finchley Ratepayers' Association, after a long discussion, in which the figures brought forward in favour of the scheme were severely handled, a motion was adopted, by 30 votes to 3, expressing the opinion that there was neither need nor demand for it. The appeal of the North Middlesex Gas Company and the Southgate and District Gas Company to the Local Government Board in regard to the matter, has resulted in the decision of that body to hold an inquiry into the Council's application for the necessary loan. The Board asked to be informed in the meantime whether the Local Authority had considered the cost of public lighting by electricity as compared with that of lighting by gas. At their meeting last week, the Council decided to send in reply a copy of the communications which have passed between them and the Gas Companies on the subject.

Newport (Mon.) Gas-Works Benefit Society.—The 33rd annual dinner of the Society was held on Monday night last week. In the unavoidable absence of Alderman Thomas Canning, J.P., the Engineer and Manager of the Company, the chair was occupied by his son, Mr. J. H. Canning. Among those present were his Worship the Mayor (Mr. G. W. White). The toast of the evening—"Success to the Newport (Mon.) Gas-Works Benefit Society"—was proposed by Alderman Greenland, who said the Society was a feature in connection with the Gas Company that might be emulated by other companies. The system of offering shares to the workmen was a thing too seldom met with among industrial concerns; but it was both beneficial to the men and to the employers, as each class was dependent on the other. He wished every prosperity to the Society. Mr. T. Donovan replied, and referred to the great strides made by the Society. He said they were very grateful to the donors, especially in the past year, when, owing to a great amount of sickness and death, they would not have been able to pay expenses had it not been for the donations. They hoped for better times this year. He proposed the healths of Alderman Canning and Mr. H. D. Hazell (the Company's Secretary); and the toast was cordially received. Other toasts followed.

BURTON-ON-TRENT GAS UNDERTAKING.

Inspection of the Gas-Works.

A party consisting of members of the Burton-upon-Trent Corporation paid a visit to the gas-works last Tuesday afternoon, on the invitation of the Gas and Electricity Committee, in order that they might be prepared to form a better opinion in regard to certain proposals to be submitted to them next day for reconstructing a portion of the plant. The members were received in the offices by the Chairman of the Committee (Alderman T. E. Lowe), the Council's Consulting Gas Engineer (Mr. J. Ferguson Bell, of Derby), and the Assistant Gas Manager (Mr. R. S. Ramsden). Alderman Lowe indicated on a large plan of the works the present arrangement of plant and the suggested site for the gasholder, and showed how it was proposed to carry out the reconstruction of the retort-houses after the holder had been erected. He pointed out that the want of adequate gasholder room had been felt for a number of years—a fact which would be easily understood when it was remembered that the combined capacity of the two holders was only a million cubic feet, while the maximum output on a winter's day was about 1¾ millions. He stated that the reconstruction of the retort-houses was to be carried out in the most economical manner; but the Committee were not prepared at present to go before the Council with a recommendation as to what form it should take. At the close of the explanation, the members went over the works, of which a brief description had been prepared for their use. A vote of thanks was accorded to the Committee and their Chairman for what was characterized as a most instructive visit; and after an acknowledgment by Alderman Lowe, and a further explanation of the Committee's policy by Mr. Wardle, the proceedings closed.

The description referred to furnished the following particulars: The gas-works cover about seven acres of land, three acres of which extend from the level crossings of the Midland Railway to the gates of the works. Coal (chiefly Derbyshire) is brought by rail into the works, and unloaded by hand labour outside the retort-houses, into which it is wheeled by the stokers, who charge by hand. There are five retort-houses, containing in all 222 retorts. The benches in the first four houses are constructed with direct-fired furnaces; those in the fifth house with regenerative furnaces. The former can produce rather more than 1¼ million cubic feet of gas per day; the latter, rather more than 750,000 cubic feet, when in full work. There are two Cornish boilers, fitted with patent furnaces to enable them to burn coke dust and inferior coal. There are three exhausters, belt-driven from countershafting by means of one or other of two horizontal steam-engines of about 12-H.P. and 15-H.P. respectively. On the inlet side of the exhausters there are two small scrubbers; on the outlet side, a "Standard" rotary washer and a Cockey washer. There are two sets of purifiers—the first, erected in 1878, consisting of four boxes let into the ground, each 22 feet long, 15 feet wide, and 4 feet deep; and the second set, erected in 1891, consisting of four overhead boxes, each 30 feet long, 17 ft. 6 in. wide, and 4 ft. 4 in. deep. The lime and oxide used in the first set are wheeled to and from the boxes by hand; while in the second set the material is dealt with by means of two spiral conveyors and a bucket elevator, driven by a 10-H.P. horizontal steam-engine. There are two gasholders—one a two-lift and the other a three-lift—with a total capacity of a million cubic feet. The other plant does not call for notice. The quantity of gas made last year was 347 million cubic feet. In addition to lighting, cooking, and heating, it is now extensively used for heating water for domestic purposes, and very largely as a motive power for pumping and in a number of trades.

Extension Scheme Approved.

At the meeting of the Corporation on Wednesday, Alderman Lowe brought up the recommendations of the Gas and Electricity Committee in regard to the proposed reconstruction and extension of the gas-works. The Committee had considered a report of Mr. Bell on the question of retort-house reconstruction and the desirability of an additional gasholder being erected. They had resolved that tenders be obtained for replacing the old retort-settings in No. 5 retort-house with Klönne regenerator settings, and for the erection of a gasholder of 1,000,000 cubic feet capacity. Alderman Lowe said some six years ago the Committee consulted the late Sir George Livesey, and on his advice brought certain proposals for the reconstruction of the works before the Council. These proposals received their sanction; and the Committee were authorized to carry out certain works at a cost of about £53,000. They consisted of a new gasholder to contain 1½ million cubic feet, a new retort-house for inclined retorts, to be built on the site of the manager's house, and sundry small improvements. The scheme was sanctioned just at the time of Burton's greatest prosperity, which, of course, corresponded with the largest amount of gas sold in one year from the works. The scheme was based on the supposition that the demand for gas would steadily increase as in the past; and in submitting it to the approval of the Council, he said that for the moment the sales had decreased a little, and that until the advance in demand again increased the Committee would not put the work in hand. It was with this pledge of his in mind that the Council approved of the scheme. Since then there had been a small but steady decrease; and therefore it became necessary to reconsider the whole proposition. Now, however, they had a reserve of £30,000, and therefore were in an admirable position to undertake whatever improvements were thought desirable. A year ago, Mr. Bell reported very exhaustively on the matter, and pointed out that four of the retort-houses were out of date, and should be replaced by a more modern house. It was proposed to erect one capable of making 2½ million cubic feet of gas per day, arranged so that it could be eventually enlarged by the removal of three of the old houses. This would involve an outlay of £7000. This increased make of gas involved the question of the storage capacity of the works. Sir George Livesey had advised the erection of a 1½ million cubic feet holder; but, in view of the falling-off in the demand for gas, the Committee recommended one having a capacity of a million cubic feet, with a steel tank, to be erected at an estimated cost of £8500. They did not make any recommendation now with regard to the new retort-house, because in any case the work could not be commenced till the new holder was completed; and when that time came, they would have the experience of others to help them still further in deciding which system of carbonizing to adopt. They, however, recommended that the settings in No. 5 retort-house, now worn out, should be taken out, and Klönne furnaces adopted. This would cost about £2000, and make the house thoroughly up-to-date, with a capacity of 750,000 cubic feet per day. With regard to the ways and means, they had £15,000 in Consols; so that for the present they would not ask the Finance Committee to make any arrangements for loans. Indeed, he quite thought they would be able to carry out the whole of the improvements without having to obtain loans. He moved the approval of the recommendations; and the motion was carried.

THE FATAL GAS EXPLOSION IN BERMONDSEY.

The Gas Company, the Water Board, and the County Council to be Proceeded Against.

At the Meeting of the Bermondsey Borough Council last Tuesday, consideration was given to a special report presented by the General Purposes Committee with reference to the fatal gas explosion in Grange Road. The Committee stated that they had conferred with the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company with reference to the damage done, and proposed a conference, in the hope that, either jointly or severally, these authorities would agree to reimburse the Borough Council the cost of making good the road, and thus avoid the necessity of legal proceedings being taken. The Committee, however, expressed regret that at the conference, which took place at Spring Gardens on the 5th inst., all three authorities, who were represented by the Chairmen of the Committees concerned, their Solicitors, and Engineers, denied liability. The Council would remember that the Town Clerk reported at a previous meeting the decision of the Coroner's Jury to be that the death of Henry Langley was due to the negligence of the County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company, who should be held jointly and severally liable. The Committee had obtained the opinion of Mr. Horace Avory, K.C., upon the matter, and they submitted the following recommendations.

1.—That the Town Clerk give the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company respectively notice that the Borough Council will, on behalf of those who shall hereafter be found to be responsible, do the work necessary to make good the damage done to Grange Road on the 30th of December last, and will hold the party ultimately found liable for the damage responsible for the expenses of so doing.

2.—That, before the work is commenced, formal notice be given by the Town Clerk to the London County Council, requiring them to remove or fill up the old sewer, and make good the ground forthwith.

3.—That should the London County Council fail to remove or fill up the old sewer, the Town Clerk give them specific notice that the Borough Council will do the work on their behalf.

4.—That writs be issued in the High Court against the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company, claiming a declaration that each of them is liable to make good the damage and loss incurred and to be incurred by the Borough Council by reason of the injury to Grange Road, and also claiming damages.

5.—That a mandatory injunction be applied for on the same writ that each defendant should execute the repairs.

6.—That, if advised by Counsel, an interlocutory application be made for the immediate issue of the mandatory injunction pending the hearing of the action.

7.—That, subject to the Finance Committee submitting an estimate for £5000, the work be carried out.

8.—That the work be carried out by the Borough Surveyor.

9.—That, to enable the Council to be in a position to independently prove the work required to be done, the specification, when prepared, be submitted to the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company.

10.—That the matter be referred to the General Purposes Committee to carry out or modify the above recommendations, with power to act as they may be advised.

The Finance Committee reported that they approved of the estimate of £5000 for the work, and recommended that application should be made to the London County Council to advance a loan for this amount for a short period.

The reports were approved.

Sale of Shares.—Five hundred ordinary fully-paid £10 shares in the Camborne Water Company were sold by auction recently, at prices ranging from £11 10s. to £12 2s. 6d. per share.

Sheringham Gas and Water Purchase Proposal.—The opposition to the proposal of the Sheringham Urban District Council to promote a Bill for the purchase of the undertaking of the local Gas and Water Company, which was manifested at the recent meeting of ratepayers, has been brought to a successful termination. A poll was taken; and when the votes were counted, it was seen that the Bill was opposed by a majority of three to one—84 votes being in favour and 311 against, or a majority of 227 for the rejection of the Bill.

Sunday Labour at the Carlisle Gas-Works.—At last Tuesday's meeting of the Carlisle Town Council, complaints were made of the Gas Committee having entered into an arrangement by which the men at the gas-works would have to work every Sunday. It was, however, pointed out by Sir Benjamin Scott that it was absolutely necessary to have some of the men on the spot on the Sunday, or else the works could not be carried on during that day. Mr. Hurst, the Chairman of the Committee, explained that the men would be getting a day-and-a-half's pay for their Sunday labour, and that they would have Mondays free. Eventually it was agreed that the men should work in shifts, so that they should have every alternate Sunday free.

LONDON COUNTY COUNCIL AND SULPHUR IN GAS.

At the Meeting of the London County Council to-day, the Public Control Committee will present the following report on the subject of sulphur in London gas.

We reported on May 26, 1908, that we had had before us particulars of the quality of the gas supplied during the year 1907 by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company, which showed that the increase in the amount of sulphur compounds (other than sulphuretted hydrogen) present in the gas since the passing of the London Gas Act, 1905, which abolished the restriction requiring purification of the gas by means of lime, was very noticeable. The average amount of sulphur in the gas supplied by each of the three Companies except the Commercial Gas Company was above the limit of 35 grains in 100 cubic feet, which it was stated by the late Chairman of the South Metropolitan Gas Company before the Departmental Committee on Gas Testing in the Metropolis would be the probable average after the removal by the above-named Act of the restriction referred to. This figure of 35 grains in 100 cubic feet is, of course, much higher than the limits of 17 and 22 grains originally imposed by the Metropolitan Gas Referees for summer and winter respectively. We have since had before us the particulars of the quality of the gas supplied by the three Companies during 1908, from which it appears that the state of affairs did not materially alter during that year. The Commercial Gas Company have again been able to supply gas containing less sulphur than an average of 35 grains in each 100 cubic feet of gas; but in the case of each of the other two Companies the amount of sulphur is considerably above this limit. Notwithstanding the efforts of these Companies, as to which we reported on July 7, 1908, to reduce the amount of sulphur as far as possible without using lime, we are of opinion that greater efforts should be made by them to reduce the amount of sulphur in the gas supplied by them.

THE BEAUFORT GAS RESIGNATIONS.

In the last number of the "JOURNAL," it was mentioned that the Solicitor of the Beaufort Gas Company (Mr. J. Moxon), the Managing-Director, Engineer, and Secretary (Mr. S. J. Acland), and one of the Directors (Mr. Hubert Russell) had sent in their resignations, as from the 1st inst.

It appears that Mr. Moxon had not been consulted as to the propriety or otherwise of any of the steps taken by the Directors. It came to his knowledge that the Company exercised their borrowing powers in contravention of section 6 of the Companies Act of 1900, and also that the certificate entitling them to commence business was obtained upon a statement which was untrue. Another ground of complaint by Mr. Moxon, when sending in his resignation, was that when settling the prospectus he asked to be supplied with full particulars of all sums paid or agreed to be paid to every director, either to induce him to become one or to qualify him to act; and that a material fact was suppressed and withheld from him—viz., that the vendors were paying the directors for their share qualification. This omission from the prospectus, he said, not only entitled the shareholders to rescind their contracts to take shares, but placed him in a position he declined to occupy for a single moment. Mr. Moxon put forward certain demands, failure to comply with which would, he said, compel him to lay the whole matter before the Court.

The resignations of Messrs. Acland and Russell were submitted in a joint letter to the Board of Directors. They called upon the Board to convene, within seven days of the date of their letter, a meeting of the shareholders, when they said they would attend to explain the true position of the Company. In the meantime, and until the meeting, they required an undertaking from the remaining member of the Board, and from the vendors, that all matters would be allowed to remain *in statu quo*, and that the Company would not enter upon any engagements or attempt to transact any business. The alternative to this course was that the Directors should forthwith put the writers in a position to refund in full the whole of the moneys received by the Company, and furnish them with a satisfactory indemnity against all claims and demands. Failing this, they said they had instructed their Solicitor to apply to the Court to restrain the Company from trading or parting with any of the assets.

A SUCTION-GAS PLANT EXPLOSION.

[Translation Reproduced from the "Electrical Review."]

Explosions have been so unusual in connection with suction-gas installations, that the following account of one that occurred recently in Berlin may be of interest.

The plant had been in use for about a year, and had worked quite smoothly up to the time of the accident. The gas-generator was intended to work three engines of 30, 30, and 50 horse power respectively. The three engines were directly connected (through small gas-chambers of about 1 cubic metre capacity) with the main gas-chamber, which was 1·3 metres high, and 1·28 metres in diameter. This last, in which the explosion occurred, was of 4 mm. sheet, with a single row of rivets. It was stiffened inside by three angle-iron rings, which also served to support the sieves. One angle-iron ring acted as a flange for the cover—the latter being of 4 mm. sheet held by ⅝-inch screws to the flange. The vessel, as used, contained neither sieves nor coke filling.

The explosion occurred about five minutes after starting the 50-horse power engine; and a subsequent inspection showed that the 44 screws had given way—some being torn in two, and others having stripped their threads. A calculation showed that the minimum pressure required for this effect would be about 12 atmospheres; and as a U-iron fixed over the cover was thrown off with such force that it passed over five two to four storeyed houses, it seems probable the actual pressure inside the vessel must have been more like 25 or 30 atmospheres.

This high pressure is confirmed by the fact that the foundations were also displaced. The mixture in the chamber and the pipes leading to it must, therefore, have had practically the most explosive proportions of gas and air possible; and as the normal mixture is in the ratio of 1 : 4 or 1 : 6, a large additional quantity of air must have got into the chamber by some means. This addition may best be explained by one or more of the following considerations.

(1) A few days before the accident the exhaust-valve had become jammed from some unknown cause; and, after breaking the hand-wheel in attempting to open it, the attendant had to leave the valve closed, and start the engines without its use. Before starting up, the usual ventilating process of drawing air and steam through the imperfectly lighted coal was gone through, until the gas drawn off at the test-cock at the engine was of a satisfactory quality. In this particular case, a specially good fire should have been made, and the preliminary suction continued longer than usual. This may not have been done, and consequently the chamber may have been more or less full of air when the engine started with the first active gas from the generator. The engine was always started electrically; then lighting gas was supplied for a short time; and, finally, this was cut off, and the engine drew in its own supply from the generator.

(2) As stated above, the three engines are all supplied direct from the main chamber, without the insertion of separate cocks or valves. This is an obvious mistake in design, as in case one of the engines happens to stop with the inlet-valve open, another engine will be able to suck air into the common pipes. Instructions had been given that all engines should be stopped in such a position that the inlet-valves were closed; but it was not possible to decide whether these instructions had been carried out in this case.

(3) An examination of the inside of the cover showed a radial marking with rust, which pointed to air leaking in at certain points round the edge cover. The amount of this leakage was estimated at about 0·3 litre per second. The period just before the accident was a cold one, with the temperature at night almost under 0° C. The gas entering the chamber at the top from the scrubber, on the other hand, had a temperature of 15° to 20° C. The air would, therefore, naturally flow along the cold walls of the chamber to the bottom, and only a small proportion of it would diffuse into the gas. The small quantities of air would gradually collect until the chamber was full. In this way the explosive mixture may have been present for some time, remaining harmless until ignited by some means.

Probably all three causes were present; and the precautions to be taken would, therefore, seem to be: (*a*) To provide cut-out valves in the various pipes; (*b*) the exhaust-valve should be kept in working order; and (*c*) a sieve should be inserted in order to prevent back-firing into the gas-chamber. Further, the covers of these chambers and of the scrubbers should have solid cast-iron flange seatings provided with reliable packing in turned slots, and the cover itself, which is subjected to heavy forces, should be so stiff that it cannot be set in vibration by the reciprocating action of the engine.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This has been an exceptionally busy day with me. Notwithstanding all the precautions taken to prevent the engagements of the Eastern and Western Districts of the Scottish Junior Gas Association clashing, that event occurred to-day, the Eastern District being engaged with visits, and the Western District holding one of their regular monthly meetings. The Eastern District began their work early in the afternoon, with a visit to the meter-works in Edinburgh of Messrs. Parkinson and W. & B. Cowan, Limited, where they were very graciously received by Mr. J. Hepworth and other gentlemen, and were conducted over a going works. All the processes in the manufacture of meters and other gas appliances for which the Company have made themselves a name were exhibited to the visitors, and very much indeed that was of the greatest interest was seen. The members were afterwards, through the courtesy of Mr. W. Gordon, the Official Inspector of Meters for the City of Edinburgh, shown over the chief testing-station, situated in the City Chambers. There the Government standards—a set of exceptionally fine instruments—are located. It may be stated that comparatively little work is done in the chief station, and necessarily so for the purpose of convenience. There are five other stations in the city, situated in the works of the meter-makers, where the proving of the meters produced is carried out. Not all of the work of testing consumers' meters is done at the chief station, for the reason that many of the returned instruments emit a pungent odour, which, it is presumed, would be unpleasant in a building frequented by Magistrates and councillors. Mr. Gordon gave his visitors a most hearty and courteous reception, and explained to the full every detail in the work of testing, not only meters, but burners and gas-lighting devices, regarding which Mr. Gordon's advice is very frequently sought by the Corporation. The visitors also saw the new photometer which has been acquired for the testing of the gas supplied from the Granton works—an excellent apparatus. In connection with this, it is to be noted that this week Mr. Gordon has received instructions from the Town Clerk, upon the authority of the Town Council, to proceed to make daily tests of the gas, which brings the Gas Order of last year into force, so far as the illuminating power of the gas is concerned.

The Western meeting began with a surprise, in the announcement of the resignation of his office by Mr. G. Braidwood, the Hon. Secretary and Treasurer. The resignation took immediate effect, and an interim appointment to the vacancy was made. There was no apparent reason for so sudden a step being taken; but there were indications, for those who kept their eyes open, that something of an exceedingly unsettling nature is disturbing affairs in the west. During his tenure of office, Mr. Braidwood has been a most capable Secretary—precise in everything

he did, and the very embodiment of courtesy to all. His unexpected resolution to quit office is therefore to be regretted. The business of the meeting was the hearing and discussion of a paper on "Main Laying," by Mr. G. H. M'Cowat, of the distributing department of the Glasgow gas undertaking. If anyone in Scotland understands the work of main laying, it is Mr. M'Cowat. Mr. M'Cowat mapped out ten different branches of his subject which he might have enlarged upon, but confined himself to four, and said that upon these he had only indicated some of the points. He spoke for over an hour, without wearying his hearers. The paper read was a very comprehensive statement by one who is thoroughly acquainted with his subject.

The Gas Committee of the Glasgow Corporation, at the weekly meeting of the Corporation on Thursday, recommended that a lease for ten years be taken of premises in Sauchiehall Street, for the exhibition of gas appliances; the lease of the premises in Union Street which have been used for this purpose expiring at Whitsunday. The Town Clerk read a letter from the Glasgow and West of Scotland Master Plumbers' Association, in which they stated that they considered the proposal of the Committee an encroachment on the interests of the plumbing and ironmongery trades; and, further, that it was against the spirit of the agreement which was come to between the Gas Department and the Master Plumbers' and Ironmongers' Associations in December, 1907. They therefore asked that the passing of the minute be delayed until the Committee of the Association had had an opportunity of laying their views before the Gas Department. The Clerk also intimated that he had received a letter in similar terms from the Glasgow and West of Scotland Ironmongers' and Allied Trades' Association. Bailie M. W. Montgomery, the Convener, said this was the first time he had heard of the communications. They did not interpret the true position; but, in view of the request in the letters, he was willing to take the minute back for a fortnight. This was agreed to.

At the Wishaw Town Council on Monday, Mr. Frew moved that they engage a gas expert to go into the whole matter relating to the gas-works, and report whether the present plant is being operated properly, or whether new plant is necessary. There was, he said, great uncertainty, not only among themselves but also with the public, over the present system of working the plant. Bailie Bell moved that at present they do not employ an expert. They had appointed a new Committee; and he considered that time should be given them to look into matters for themselves. Bailie M'Namee considered their Manager as good an expert as they could get. Provost Thomson had no faith in experts. He favoured a proposal to visit other gas-works. The Council, by seven votes to four, decided on having an expert, and agreed to ask Mr. T. Wilson, of Coatbridge, to undertake the work.

The Corporation of Arbroath on Monday considered the subject of the extension of the storage capacity for gas, and resolved, on the recommendation of the Engineer and Manager—Mr. A. C. Young—that erecting a new gasholder, upon new ground, would be preferable to constructing an enlarged holder within the tank of an existing holder. A deputation from the Gas Committee had visited a number of other towns, and were satisfied that a spiral-guided holder would be suitable, and would cost less—about £5000 for a holder of 400,000 cubic feet capacity, as compared with £6300 for a standard-guided holder. Instructions were given to receive tenders for the erection of a holder upon new ground.

In the Dumfries Town Council last week, the minutes of the Gas Committee stated that a meeting was called on Jan. 21 in consequence of, and to inquire into, an unfortunate occurrence at the gas-works two nights previously, when the gas supply in the burgh failed for a short time. A report by the Manager—Mr. G. Malam—was read to the Committee, in the course of which it was stated that the man in charge of the valves in the meter-house, in changing from the bye-pass to the gasholder outlet-valve, found that, when the former was closed, the latter had failed to act through misbandling; hence the slight stoppage. As soon as this was observed—within a few seconds—the gas was bye-passed to the town. Since the mishap, the outlet-valve has been carefully examined, overhauled, tried, and re-tried, and now works quite freely. The Committee, it is reported, unanimously arrived at the resolution and instruction to the Manager that in future only a thoroughly reliable and responsible man be constantly employed in the work of regulating the supply of gas. They also passed a unanimous vote of thanks to Mr. Smith, the foreman at the gas-works, for his promptitude in the emergency.

The Sanquhar Town Council had before them at the end of last week a report by an expert upon the condition of the gas-works. In this document, it was stated that the works had been greatly improved since the Council acquired them; and the output of gas was increasing. The new retorts which were put in had been burned out in fourteen months, not on account of any defect in their setting, but probably because of their having to be lighted up immediately on their being put in position. It was suggested that a new retort-bench be erected, and a gasholder repaired; and the other parts of the plant being in good order and efficient, it was believed that the works would not require much further outlay for a long time to come. The Council agreed to have the works suggested executed, under the supervision of Mr. J. O'Neill, of Old Cumnock, at a probable cost of £600.

Suicide by Gas at Bradford.—A commission agent named Downes was found lying dead on the floor of his office at Bradford, with two gas-jets turned on full but not lighted. Deceased's son said that his father had been a heavy drinker, and lately experienced financial difficulties. The Coroner's Jury returned a verdict of "Suicide."

Reduction in Price at Kingston-on-Thames.—At the half-yearly meeting of the Kingston-on-Thames Gas Company last Tuesday, the report of the Directors, in which it was intimated that a reduction had been made in the price of gas, from 2s. 10d. to 2s. 9d. per 1000 cubic feet as from the commencement of the current quarter, was unanimously adopted.

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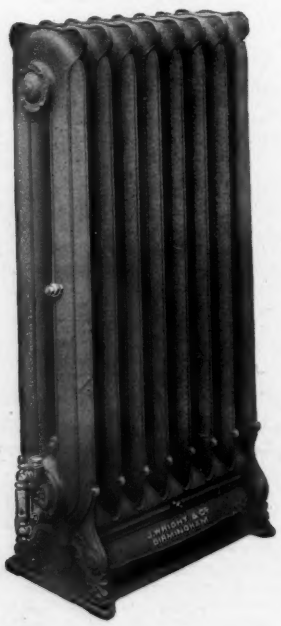

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CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Feb.* 13.

There has been improved demand, and, although prices have been somewhat irregular, there has on the whole been a slight advance. At the close, the tone is again quiet; but the quotations are £11 6s. 3d. per ton f.o.b. Hull, £11 8s. 9d. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. In the forward position, the firmness of makers practically precludes first-hand business. There has been some inquiry for delivery over the spring months; but the ideas of buyers are scarcely above the level of spot prices.

Nitrate of Soda.

This article is very quiet in all positions, and spot prices are reduced to 9s. 4½d. per cwt. for 95 per cent., and 9s. 6d. for refined quality.

Tar Products. LONDON, *Feb.* 15.

There has been little variation in the markets for tar products during the past week. Pitch remains in about the same position. There are sellers on the east coast at 18s., and in London at 18s. 6d., for delivery between now and the end of June. On the west coast, there is not very much pitch offering, and values are about 17s. to 18s. f.a.s. Mersey ports. In South Wales, there is practically no business doing, and very low prices are reported to have been accepted on the Continent for delivery over the present year. Benzol, 90 per cent., is quiet, and business is difficult indeed to negotiate, as, in spite of the very low prices which are quoted, there does not appear to be any anxiety on the part of consumers to purchase. Sales have been made in the North at 5½d. for delivery over the present year; while London manufacturers find it impossible to secure anything over 6d. There is not just now much demand for 50-90 per cent. benzol, which is quiet; and the same may be said of toluol. Solvent naphtha is steady; but the majority of consumers appear to have covered their requirements for the present. On the other hand, manufacturers are fairly well sold, and have no urgent need to offer. Creosote is steady. The principal London makers are firm in their ideas, but outside makes can be secured at 2¾d. to 2¾d. In the Midlands, 2¾d. to 2⅞d. is asked; while in the North, 2⅝d. to 2¾d. is about the ruling value. Carbolic acid is still quiet, and the outside value on the east coast is 1s. for 60's, and on the west coast 11½d., at both of which prices business has been done. Refined naphthalene is slightly firmer; while salts are in fair demand.

The average values during the week were: Tar, 10s. 9d. to 14s. 9d., *ex* works. Pitch, London, 18s. to 18s. 6d.; east coast, 18s. to 18s. 3d.; west coast, 17s. to 18s. f.a.s. Mersey ports, 17s. 3d. to 17s. 9d. f.o.b. others. Benzol, 90 per cent., casks included, North, 5½d. to 5⅝d.; London, 6d.; 50-90 per cent., casks included, North, 6¼d. to 6½d.; London, 6⅝d. Toluol, casks included, North, 8¾d. to 9d.; London, 9¼d. Crude naphtha, in bulk, North, 3½d. to 3¾d.; London, 3¾d. to 3⅞d.; solvent naphtha, casks included, North, 10d. to 10¼d.; London, 11d. to 11¼d.; heavy naphtha, casks included, North, 10d. to 10½d.; London, 11d. to 11½d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2⅝d. to 2¾d. Heavy oils, in bulk, 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s.; west coast, 11½d. Naphthalene, £4 to £8; salts, 32s. 6d. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 2d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been quiet throughout the past week, and there has not been very much business. In London, the principal Gas Companies still quote £11 15s. to £11 17s. 6d. for prompt or forward delivery, which means that they are practically out of the market at present, as outside makes are selling upon Beckton terms at £11 7s. 6d. to £11 10s. In Hull, business has been done at £11 17s. 6d.; while in Liverpool £11 18s. 9d. has been accepted. In Leith, it is doubtful whether the value is anything over £11 10s. to £11 11s. 3d.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been greater activity in some of the branches of the coal trade in the North-east; and after a period of quietness the prices have stiffened—possibly because of the larger shipments of coal that have been made the last few days. In steam coals, the current quotations are from about 9s. 9d. to 10s. per ton f.o.b. Second-class steams are from 9s. 3d. to 9s. 7½d., and steam smalls are scarcer and at rather better prices—from about 3s. 9d. to 5s. 3d. The collieries are now working more time per week, though there are still one or two where short time is being worked. In the gas coal trade, the demand remains good, both for home use and for export; but the quantities being sent to some of the large buyers are now a little less than they were a month or so ago. Durham gas coals vary in price, according to quality, from about 8s. 9d. to 9s. 9d. per ton f.o.b. for the usual classes, and up to 10s. 6d. for "Wear specials." Some additional sales of gas coal have been made for shipment over the season—to Italian ports especially. One or two small contracts for the North have been settled—one at about 14s. 8d. delivered at a Norwegian port. It is believed that a part of a Dutch contract has been placed for best Wear gas coals; while other contracts are pending. Coke is quieter; and for gas coke, from 11s. 9d. to 12s. 9d. per ton f.o.b. in the Tyne or Wear is quoted.

Scotch Coal Trade.

Trade is not improving. At this season of the year export is usually slack; but this year it is more so, on account, it is stated, of business

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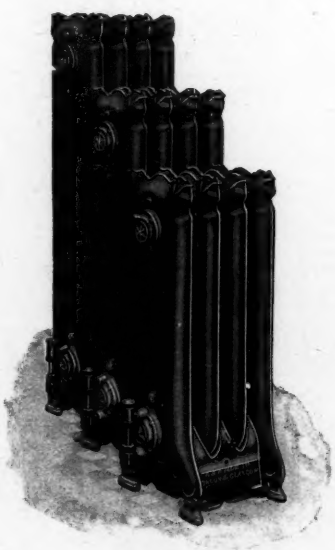

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being now diverted to North of England ports by the railway demurrage charges. This may be only a temporary effect; but, on the other hand, as was stated by Lord Inverclyde at a meeting in Glasgow the other day, trade once deflected was difficult to get back. For home consumption, splint is in less request, and prices have eased a little. The prices quoted are: Ell 9s. 3d. to 10s. 3d., splint 10s. to 10s. 3d., and steam 9s. 9d. to 10s. per ton f.o.b. Glasgow. The shipments for the week amounted to 239,845 tons—a decrease of 24,886 tons upon the preceding week, but an increase of 10,659 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,162,194 tons—an increase of 45,334 tons upon the corresponding period.

Conditions of Employment at Birmingham.

Presiding at a meeting of the Birmingham Trades Council a few days ago, Mr. W. J. Morgan, who was one of the deputation appointed to interview the Gas Committee regarding a suggestion made that the department refused to employ men over forty years of age, said the Committee emphatically denied there was any rule prohibiting the employment of a man over that age. Further, the Committee asserted that they had not given any instructions to their officials against employing men over forty. Speaking personally, he believed this was true. At the same time, he had no doubt that in actual practice it was only in very rare cases a man over forty years of age received a permanent situation. It seemed to him the responsibility, if any, rested upon the men themselves, because their sick club rules stipulated that a member could not be admitted under sixteen nor over forty. This rule, which he understood the Chairman of the Gas Committee had endeavoured to break down, had the effect of excluding many men. The deputation were placed in a very awkward position, because they could not produce the man whose name had been mentioned in the matter. He had left the district; and, moreover, the official to whom he was said to have applied stated that he was not employed because he was unsuitable. They had no right to appoint a deputation on such flimsy evidence as they had in this case.

Gas-Workers' Wages at Oldham.

In a letter sent to Mr. J. R. Clynes, M.P., the representative of the gas-workers, the Oldham Gas Committee stated that, though they were quite satisfied that, taking the whole of the men as a body, the rates of pay at Oldham compared very favourably with other large towns, yet, with a view to settling the matter once and for all, and with the object of making the men entirely satisfied, they had agreed, subject to the Council's approval, to increase the wages of the machine men from 5s. 4d. to 5s. 8d. per shift, coke-conveyor engine men from 4s. 4d. to 4s. 9d. per shift, small coal-elevator engine man from 4s. 4d. to 4s. 9d. per shift, and the large coal-elevator man from 6½d. to 7d. per hour. No alteration would be made in the wages of lid-men, pipe-jumpers, and furnace-men, as they were already paid at a higher rate than in the majority of towns. The question of holidays with pay could not be considered by the Committee so long as the resolution by the Council relating to this point remained in force. In reply, Mr. Clynes said he appreciated the spirit of the letter; but it failed in its object of making the men entirely satisfied. The proposed advances applied only to a minority of the men. It was felt that the lid-men, pipe-jumpers, and furnace-men were certainly entitled to some consideration, even if their wages were to be determined by comparison with other places. The case of the men of Higginshaw and Hollinwood employed as cellarmen, scurfers, flue-cleaners, crane-drivers, furnace-men, exhaustermen, engine-men, coal elevator and conveyor men, &c., should also be further considered, as the matter would remain unsettled if the men were left as at present. Those who were paid on hour rates were at least entitled to an advance similar to that named for the elevator-engine man. The Committee decided to discuss the matter in private.

Water Supply in Russian Towns.

According to an article in the Engineering Supplement to "The Times" last Wednesday, the bad condition of the water supply of St. Petersburg has been forced on the attention of the authorities by the persistence of cholera in the city. It is stated in the "Novoe Vremya" that four samples of filtered water were taken from different places; and, on examination, they all showed cholera bacilli. It was even seriously suggested by the Cholera Committee that all the reservoirs, the mains, and the house supply-pipes should be disinfected with chemicals, notwithstanding the incalculable inconvenience that such a step would cause. The filter-beds have been left unrenewed for so many years that the men sent to clean them are often obliged to desist from their work by reason of the stench that arises as soon as they have removed the top layer of sediment. It is stated that many Russian towns are without water-mains altogether. It appears that out of 1080 towns in Russia, only 192, or 17·8 per cent., are so supplied, and not one of them can boast of a really efficient water-main system. As a consequence, private water companies are very numerous in Russia. With capital varying from £53,000 to £191,000, they make profits of £3187 to £9562 annually. There are exceptions, such as the Kieff Company, who show a profit of £27,625 for the year. The Moscow, Odessa, Warsaw, and Kharkoff water systems belong to the respective towns. The profit of the Warsaw water service amounted in 1907 to £56,000, which is more than has been realized even by any share company in the country. At Baku, a town of 180,000 inhabitants, great difficulty has been experienced with the water supply; and negotiations are now in progress for an additional supply from the Kurinsk Spring Water Company, to be brought in barges from the River Kura, *viâ* the Caspian Sea, a distance of about 60 miles. The situation in other parts of the Caucasus is stated to be similar to that at Baku.

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(Incorporating Maughan's Patent Geyser Co.) LTD.

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The London County Council and the Gaslight and Coke Company's Bill.—At the meeting of the London County Council last Tuesday, it was decided by an absolute majority, as required by the Borough Funds Act, to oppose the Bill promoted by the Gaslight and Coke Company, and to charge the expenses on the County Fund. This action was the result of a recommendation by the Parliamentary Committee; and it will have to be approved by the Local Government Board.

The Expenses of the Ceremonial Opening of the Honor Oak Reservoirs.—At the meeting of the Metropolitan Water Board last Friday, considerable discussion ensued on a recommendation by the Works and Stores Committee that an estimate of £150, to be submitted by the Finance Committee, be approved, and that the Committee be authorized to incur expenditure not exceeding this amount in connection with the ceremonial opening of the Honor Oak reservoirs, on the understanding that no part of the expenditure will be used in respect of refreshments or travelling expenses. Lord Welby said the Finance Committee were in a great difficulty when they came to consider the proposal, in view of the action of the District Auditor in the case of the Walton reservoirs. He had seen the Secretary to the Local Government Board, who had told him that he did not think objection could be taken to any reasonable expenses which might be incurred. Two amendments to the recommendation were defeated; and eventually the proposal was carried by 21 votes to 11.

Revenue from Gas-Mantle Ashes.—At the meeting of the London County Council last Tuesday, Mr. J. D. Gilbert asked the Chairman of the Education Committee (Mr. Cyril Jackson) if an advertisement had been issued in the Council's "Gazette," instructing the keepers of non-provided schools to preserve the ashes from incandescent gas-mantles; if so, what revenue per annum had been received from the sale of the ashes; and if the education rate was likely to be reduced as the result of the sale. Mr. Jackson replied that the amount received up to the present from the sale of the ashes was £70 4s., which was nearly equal to the salary of an assistant mistress. He thought the Council were entitled to receive congratulations on their economy.

Extension of the Co-Partnership System.—Another firm (Messrs. John Knight, Limited, the soap makers) has adopted the principle of making the employees shareholders in the Company. Mr. J. W. Hope, one of the Managing-Directors, announced at the annual meeting of shareholders last Friday that a scheme had been formulated whereby a portion of the bonuses to employees would be paid in shares in the business. The employees would thus receive a proportion of whatever dividend was paid. "This," said Mr. Hope, "will cement the common interests of employees and employers more and more; and, judging from the results we have experienced from the bonus scheme in the past, the Directors feel justified in recommending the altered arrangement to the shareholders."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SUPERINTENDENT. Sheffield Gas Company. Applications by Feb. 25.
OUTDOOR SUPERINTENDENT. Waterford Gas-Works.
OUTDOOR INSPECTOR. No. 5060.
MECHANIC Isle of Thanet Gas Company. Applications by Feb. 25.
GAS-FITTER. Ilfracombe Gas Company.
CANVASSER (HEATING AND COOKING). No. 5059.

Situations, &c., Wanted.

ASSISTANT-MANAGER. E. Sainter, Gas-Works, Longwood.
DIVING (SURVEYING OR CONSTRUCTIONAL). Lambert, Kennington.
METAL PRINTER. "F.O.B. 2667," care of Rudolf Mosse, Frankfurt.
SECRETARY OR OTHER POSITION. No. 5058.

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STATION METERS Laidlaw and Sons (Edinburgh), Limited.
STREET LAMPS. Voelker Lighting Corporation.

Plant, &c. (Second-Hand), Wanted.

EXHAUSTER, ENGINE, WASHER, AND HYDRAULIC MAIN, &c. Airdrie Gas-Works.

Meetings.

BRIGHTON AND HOVE GAS COMPANY. London office. Feb. 26. Two o'clock.
BROMLEY AND CRAYS GAS COMPANY. Bell Hotel, Bromley. Feb. 24. Six o'clock.
ENFIELD GAS COMPANY. Offices. Feb. 25. 5.30 o'clock.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. Feb. 23.
HARROW AND STANMORE GAS COMPANY. Feb. 25.
HERTS AND ESSEX WATER COMPANY. Feb. 23.
SOUTH ESSEX WATER COMPANY. March 2.
SOUTH-WEST SUBURBAN WATER COMPANY. Feb. 23.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 18.

TENDERS FOR

Oil for Gas Manufacture.

CARLISLE GAS DEPARTMENT. Tenders by March 1.

Oxide of Iron.

CARLISLE GAS DEPARTMENT. Tenders by March 1.
MANCHESTER GAS DEPARTMENT. Tenders by March 25.

Purifiers.

COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by Feb. 25.

Tar.

CARLISLE GAS DEPARTMENT. Tenders by March 1.
MANCHESTER GAS DEPARTMENT. Tenders by March 25.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 441.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 15	10	Alliance & Dublin 10 p.c.	18¾—19	..	5 5 3
568,324	10	,,	7	Do. 7 p.c.	12⅞—13¼	..	5 5 8
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	9⅝—100	..	4 0 0
200,000	5	Oct. 29	6⅓	Bombay, Ltd.	5⅝—5¾	..	5 10 8
40,000	5	,,	6⅓	Do. New £4 paid	4—4¼	+⅛	6 2 4
50,000	10	Aug. 27	7⅘	Bourne-mouth Gas and Water B 7 p.c.	29—30	..	4 13 4
51,810	10	,,	7	Do. Pref. 6 p.c.	16¼—17	..	4 2 4
53,200	10	,,	6		15½—16¼	..	3 13 10
380,000	Stk.	Aug. 13	12½	Brentford Consolidated	249—252	+1	4 19 2
300,000	,,	,,	12½	Do. New	189—192	+1	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	101—103	..	3 17 8
220,000	Stk.	Sep. 11	6⅔	Brighton & Hove Orig.	214—217	..	4 19 1
246,320	,,	,,	7½	Do. A Ord. Stk.	153—156	..	4 19 4
467,000	20	Oct. 15	10	British	42—43	−⅛	4 13 0
109,000	Stk.	Aug. 27	6	Bromley, Ord. 5 p.c.	115—117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	84—86	..	5 4 8
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	12¼—12⅝	+⅛	5 9 10
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94—96	+1	4 3 4
150,000	20	July 15	7½	Cagliari Ltd.	25⅝—26⅓	..	5 9 5
100,000	10	—	—	Cape Town & Dis., Ltd.	4⅝—5⅛	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c. Pref.	4⅝—5⅛	..	8 3 8
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	47—49	..	6 2 5
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73—78	..	5 15 5
157,150	Stk.	Aug. 13	5	Chester 5 p.c. Ord.	111½—113½	..	4 8 1
1,491,280	Stk.	Aug. 27	5⅝	Commercial 4 p.c. Stk.	107—109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.	103—105	..	4 15 3
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	101—103	..	6 6 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—140	..	5 0 0
467,170	Stk.	—	5	Derby Con. Stk.	122—124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
145,995	,,	Sep. 30	5	East Hull 5 p.c. Ord.	95—100	..	5 0 0
486,093	10	Jan. 28	12	European, Ltd.	23⅞—24	..	5 0 0
354,663	10	,,	12	Do. £7 10s. paid.	17¼—17⅝	−¼	5 1 5
15,161,545	Stk.	Feb. 11	4/10/8	Gas light and Coke 4 p.c. Ord.	101—102*	+¾	4 8 10
2,600,000	,,	,,	3⅜	3½ p.c. max.	87½—88¾*	..	3 19 1
3,799,735	,,	,,	4	4 p.c. Con. Pref.	104—106*	+¼	3 15 6
4,193,975	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	84½—85½	..	3 10 2
258,740	Stk.	Sep. 11	4⅜	Hastings & St. L. 3½ p.c.	95—97	..	4 17 11
82,500	,,	,,	6⅔	Do. do. 5 p.c.	113—115	..	5 8 8
70,000	10	Oct 15	11	Hongkong & China, Ltd.	18—18⅞	..	5 18 11
123,500	Stk.	Sep. 11	6½	Ilford "A" and "C"	132—134	..	4 17 0
65,781	,,	,,	5	Do. "B"	104—106	..	4 14 4
51,000	,,	Dec. 30	4	Do. 4 p.c. Deb.	102—104	..	3 16 11
4,940,000	Stk.	Nov. 13	8	Imperial Continental	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	94—96*	+¾	3 12 11
195,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	Aug. 27	10	Liverpool United A.	232—234	..	4 5 6
718,100	,,	,,	7	Do. B	172—174	..	4 0 6
306,083	,,	Dec. 30	4	Do. Deb. Stk.	105—107	..	3 14 9
55,000	5	Dec. 11	6	Malta & Medn., Ltd.	4⅝—4¾	..	6 3 1
500,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	+1	4 17 1
250,000	100	,,	4⅓	Melbourne 4½ p.c. Deb.	101—103	+1	4 7 5
541,920	20	Nov. 13	3⅓	Monte Video Ltd.	11½—12	..	5 16 8
1,775,892	Stk.	July 30	4½†	Newc'tle & G'tesh'd Con	109—111	−⅛	4 1 1
518,795	Stk.	Dec. 30	3⅓	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Aug. 27	10	North Middlesex 10 p.c.	20—20½	..	4 17 6
55,940	10	,,	7	Do. 7 p.c.	13⅜—14	..	5 0 0
302,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—142	..	5 12 8
60,000	5	Sept. 20	8	Ottoman, Ltd.	6½—6⅝	..	6 5 6
31,800	53	Aug. 27	13	Portsea Island A.	138—140	..	4 18 6
60,000	50	,,	13	Do. B.	132—134	..	4 17 0
100,000	50	,,	12	Do. C.	122—124	..	4 16 9
114,800	50	,,	10	Do. D and E.	104—106	..	4 14 4
398,490	5	Oct. 29	7	Primitiva Ord.	6⅛—6⅜	+⅛	5 9 10
796,583	5	Jan. 28	5	Do. 5 p.c Pref.	5—5¼	..	4 15 3
488,903	100	Dec. 1	4	Do. 4 p.c Deb.	95—97	..	4 2 6
1,200,000	10	Oct. 15	8	River Plate Ord.	13⅜—14⅛	+⅛	5 12 3
312,650	Stk	Dec. 30	4	Do 4 p.c. Deb.	94—96	+1	4 3 4
250,000	0	Sept. 30	8	San Paulo, Ltd.	14—14⅛	..	5 10 4
125,000	50	Jan. 2	5	Do 5 p.c. Deb.	49—50	..	5 0 0
135,000	Stk	Sept. 11	10	Sheffield A	240—242	..	4 2 8
209,981	,,	,,	10	Do. B	239—241	−1	4 3 0
523,500	,,	,,	10	Do. C	238—240	..	4 3 4
70,000	10	Oct. 29	10	South African	13⅜—14	..	7 2 10
6,429,895	Stk.	Feb 11	5/6/8	South Met., 4 p.c. Ord.	119—121*	+⅜	4 8 1
1,895,445	,,	Jan 14	3	Do. 3 p.c. Deb.	84—85	..	3 10 7
209,823	Stk.	Aug. 31	8	South Shields Co's. Stk.	153—155	..	5 3 3
605,003	Stk.	Aug. 13	5⅛†	S'th Suburb'n Ord. 5 p.c.	120—122	+1	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	121—123	..	4 1 4
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	Nov. 13	5	Southampton Ord.	107—109	..	4 11 9
120,000	Stk.	Aug. 13	6⅔	Tottenham A 5 p.c.	134—136	..	4 19 3
423,940	,,	,,	5⅓	and B 3½ p.c.	106—108	..	4 17 3
149,470	,,	Dec. 30	4	Edmonton 4 p.c. Deb.	100—102	..	3 18 5
182,380	,,	,,	8	Tuscan, Ltd.	8¾—9¼	..	8 13 0
149,900	10	Jan.	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
193,742	Stk.	Aug. 27	5	Tynemouth, 5 p.c. max.	106—108	..	4 12 7
255,636	Stk.	Aug. 27	6½	Wandsworth B 3½ p.c.	128—130	..	5 0 0
79,416	,,	Dec. 30	3	and Putney 3 p.c. Deb. Stk.	72—74	..	4 1 1
895,872	,,	Aug. 27	5⅓	West Ham 5 p.c. Ord.	115—117	..	4 7 7
210,000	,,	,,	5	Do. 5 p.c. Pref.	124—126	..	3 19 4
253,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—107	..	3 14 9

Prices marked * are "Ex div." †.Next Dividend will be at this rate.

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See Advertisement on p. 423.

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SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement Feb. 2, p. 284.

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SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by

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